ENERGY STRATEGY REVIEW

43 LONDON STREET, READING RG1 4PS

ME7 LTD

Jorand House, Bebington Close
Billericay, Essex
CM12 0DT

ASSESSMENT INFORMATION

Prepared by:
Ondrej Gajdos,

Date:
11 August 2025

DISCLAIMER

The findings, conclusions and recommendations of this report are based on the information supplied. ME7 Ltd disclaims responsibility in respect of incorrect information imparted to them or for the actual performance of any of the building services installations.
This Report is prepared for the use of 43 London Street, Reading; a duty of care is not owed to other parties.

ME7 Ltd have been appointed to provide this report as a supplemental document to the original Energy Statement and subsequent Technical addendum produced by Envision in April 2020. Reason for updating the energy statement are recent changes in the heating strategy, more recent and more detailed information on building fabric and also substantial changes in carbon emission factors introduced in 2021 building regulations.

Baseline and all estimated energy consumptions have been calculated using SAP 2012 assessment of all proposed flats in accordance with 2013 Part L procedures. CO2 emissions are reported using SAP10.2 emission factors. The main difference is a significant decrease in the CO2 emission factor for grid electricity, caused by substantial de-carbonisation of grid electricity sources in recent years. This makes electricity-driven heat sources more viable and more carbon-efficient than previously proposed gas boilers.

The tables below show a summary of changes in the heating strategy and resulting energy requirements for baseline scheme and reduction proposed achieved by passive measures, efficient services and on-site renewable energy sources. Results for the previously proposed heating strategy, calculated using new SAP10.2 emission factors are included for information

Table 1: Changes in the specification

Specification	Original proposal	New proposal
Space Heating and DHW	Gas combi boilers, SEDBUK2009 efficiency 89.5%,	Exhaust air MVHR heat pump Nilan Compact P, providing space heating through warm air an dhot water through integrated hot water cylinder
Solar Photovoltaic	15.18 kWp output, panels facing south at 30° pitch	-
CO2 emission tonnes CO2/year	**17.1**	**3.2**

All other specification (fabric, air permeability, ventilation etc.) is identical in both scenarios, as shown in the appendix

Results comparison

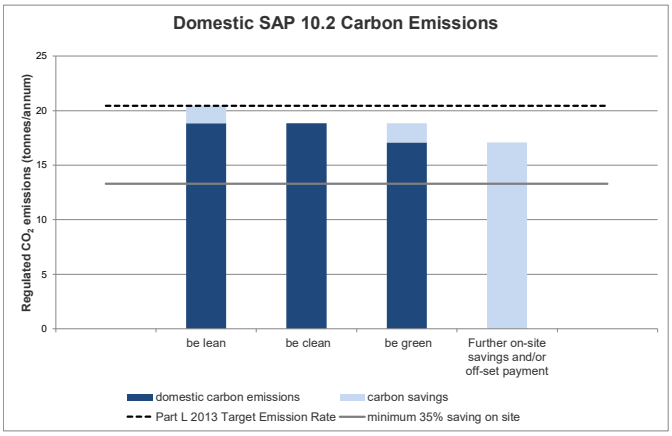
Calculation results using specification from the **original proposal**, with SAP10.2 emission factors

Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	20.4	6.6
After energy demand reduction	18.9	6.6
After renewable energy	17.1	6.6

Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	1.6	8%
Savings from renewable energy	1.8	9%
Cumulative on site savings	**3.4**	**17%**



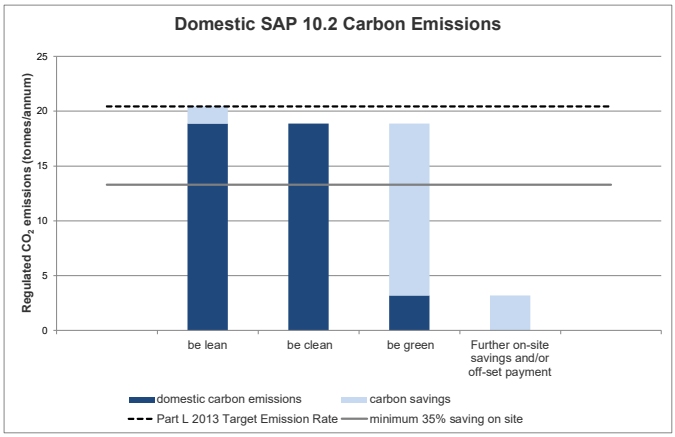
Calculation results using specification from the **new proposal**, with SAP10.2 emission factors

Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	20.4	6.6
After energy demand reduction	18.9	6.6
After renewable energy	3.2	6.6

Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	1.6	8%
Savings from renewable energy	15.7	77%
Cumulative on site savings	**17.2**	**84%**



Detailed **Proposed** energy consumption and CO2 emission

DOMESTIC ENERGY CONSUMPTION AND CO_2 ANALYSIS											
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area (m^2)	REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - 'BE GREEN' SAP DER WORKSHEET					SAP 10.2 REGULATED CO_2 EMISSIONS PER UNIT				
		Space Heating (Heat Source 1)	Domestic Hot Water (Heat Source 1)	Electricity generated by renewable (-)	Lighting	Auxiliary	Space Heating	Domestic Hot Water	Lighting	Auxiliary	SAP 10.2 CO_2 emissions ($kgCO_2$ p.a.)
FLAT 02	40	1119	1180	-379	193	84	152	160	26	11	299
FLAT 03	38	580	1162	-360	201	80	79	158	27	11	226
FLAT 04	48.3	1415	1259	-457	225	101	192	171	31	14	346
FLAT 05	60.2	1894	1375	-570	274	137	258	187	37	19	423
FLAT 06	73	2275	1486	-691	321	166	309	202	44	23	484
FLAT 07	60.2	1404	1375	-570	273	137	191	187	37	19	356
FLAT 08	75.1	1471	1502	-711	329	171	200	204	45	23	376
FLAT 09	57.3	1978	1347	-543	262	128	269	183	36	17	431
FLAT 10	68.2	2375	1447	-646	304	152	323	197	41	21	494
FLAT 11	86.2	2778	1571	-816	365	197	378	214	50	27	557
FLAT 12	56	1715	1335	-530	256	118	233	182	35	16	394
FLAT 13	55.7	919	1332	-528	255	117	125	181	35	16	285
FLAT 14	59.5	1344	1369	-564	270	125	183	186	37	17	346
FLAT 15	58.2	953	1356	-551	265	122	130	184	36	17	292
FLAT 16	61.3	1963	1386	-581	277	126	267	188	38	17	431
FLAT 17	51.9	1218	1294	-492	240	109	166	176	33	15	322
FLAT 18	76	2573	1508	-720	332	173	350	205	45	24	526
FLAT 19	55.7	1441	1332	-528	255	117	196	181	35	16	356
FLAT 20	55.7	1441	1332	-528	255	117	196	181	35	16	356
FLAT 21	55.6	1828	1331	-527	255	117	249	181	35	16	409
FLAT 22	84.5	3130	1562	-800	360	250	426	212	49	34	612
Sum	1,277	35,816	28,842	-12,091	5,767	0	4,871	3,923	784	387	8,321

Conclusion

Using the new SAP10.2 emission factors, CO2 reduction achieved by the original proposal is only 17% (although it was achieving a 35.54% reduction using old SAP2012 emission factors in the original energy statement). Even with solar PV system removed, the new proposal achieves 84% reduction using SAP10.2 emission factors.
Currently proposed heating strategy is proving to be more efficient in terms of CO2 reduction that the originally proposed gas boilers, when new SAP10.2 carbon factors are used.

Appendix – SAP calculation specification for the current proposal

	Thermal element	U-value (W/m^2K)	Source of U-value	Notes
Building fabric	Pitched roof	0.11	Assumed design stage specification	Build up TBC
	Party walls	0.00	Assumed design stage specification	Flat/Flat party walls fully filled with insulation
	All other walls, roofs and floors		Calculated from architect design drawings	All constructions to be insulated in accordance with Brookes Architects construction drawings
	Windows and glazed doors	1.1	Design stage specification provided by client	Double glazed
	Glass block walls	0.92	Design stage specification provided by client	Pilkington Profilit™ triple glazed
	Roof windows	1.30	Assumed design stage specification	Double glazed

	Specification		Source of information
M&E	Ventilation	MVHR integrated in NILAN Compact P heat pump unit, insulated ducts to and from exterior;	Design stage specification provided by client
	Space heating and hot water	Exhaust air MVHR heat pump Nilan Compact P, providing space heating through warm air and hot water through integrated hot water cylinder	Design stage specification provided by client
	PV system	Not required to achieve the targets	
	Low energy lights	100% LED lighting	Recommended, required to achieve the targets

	Specification	Source of information
Other	Air permeability rate: 5 m3/h.m2	Recommended, required to achieve the targets
	Thermal bridging - custom Psi-values calculated using architect details	Calculated from architect design drawings

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:29

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 40m²

Site Reference : 43LS **Plot Reference:** FLAT 02

Address : FLAT 02, 43 London Street, Reading, RG1 4PS

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	30.63 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.63 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.15 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.17 (max. 0.25)	0.18 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	0.90 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

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

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	1.7m²
Windows facing: North	1.71m²
Windows facing: South	1.71m²
Windows facing: East	2.87m²
Ventilation rate:	6.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.13 W/m²K
Roofs U-value	0.11 W/m²K
External Walls U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.1 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 02

Address : FLAT 02, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	40	(1a) x	2.3	(2a) =	92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	40	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		92	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

DER WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

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

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.13	=	0.273			(26)
Windows Type 1			1.7	x1/[1/(1.1)+ 0.04]		=	1.79			(27)
Windows Type 2			1.71	x1/[1/(1.1)+ 0.04]		=	1.8			(27)
Windows Type 3			1.71	x1/[1/(1.1)+ 0.04]		=	1.8			(27)
Windows Type 4			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Floor Type 1			6	x	0.1	=	0.6	20	120	(28)
Floor Type 2			34	x	0.18	=	6.12	20	680	(28)
Walls Type1	20.24	7.99	12.25	x	0.15	=	1.84	150	1837.5	(29)
Walls Type2	18.86	2.1	16.76	x	0.11	=	1.84	14	234.64	(29)
Roof	1.1	0	1.1	x	0.11	=	0.12	9	9.9	(30)
Total area of elements, m²			80.2							(31)
Party wall			57.04	x	0	=	0	20	1140.8	(32)
Party floor			34					30	1020	(32a)
Party ceiling			38.9					20	778	(32b)
Internal wall **			39.1					9	351.9	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 19.21 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6172.74 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 154.32 (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 — 12.03 (36)

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

Total fabric heat loss (33) + (36) = — 31.24 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	10.99	10.85	10.72	10.06	9.92	9.26	9.26	9.13	9.53	9.92	10.19	10.46	(38)

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

(39)m=	42.23	42.1	41.96	41.3	41.17	40.5	40.5	40.37	40.77	41.17	41.43	41.7	

Average = Sum(39)$_{1...12}$ /12= 41.27 (39)

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

(40)m=	1.06	1.05	1.05	1.03	1.03	1.01	1.01	1.01	1.02	1.03	1.04	1.04	

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

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 1.41 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 67.6 (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=	74.36	71.66	68.95	66.25	63.54	60.84	60.84	63.54	66.25	68.95	71.66	74.36	

Total = Sum(44)$_{1...12}$ = 811.21 (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=	110.27	96.45	99.52	86.77	83.26	71.84	66.57	76.39	77.31	90.09	98.34	106.79	

Total = Sum(45)$_{1...12}$ = 1063.62 (45)

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

(46)m=	16.54	14.47	14.93	13.02	12.49	10.78	9.99	11.46	11.6	13.51	14.75	16.02	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06

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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06

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

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

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

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

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=	124.34	109.15	113.59	100.38	97.32	85.45	80.64	90.46	90.91	104.15	111.95	120.86

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

Output from water heater

(64)m=	124.34	109.15	113.59	100.38	97.32	85.45	80.64	90.46	90.91	104.15	111.95	120.86

Output from water heater (annual)$_{1...12}$: 1229.18 (64)

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

(65)m=	36.67	32.07	33.09	28.85	27.68	23.89	22.14	25.4	25.7	29.96	32.7	35.51

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=	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32

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

(67)m=	10.91	9.69	7.88	5.97	4.46	3.77	4.07	5.29	7.1	9.01	10.52	11.22

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

(68)m=	121.53	122.79	119.62	112.85	104.31	96.28	90.92	89.66	92.84	99.6	108.14	116.17

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

(69)m=	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03

Pumps and fans gains (Table 5a)

(70)m=	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52

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

(71)m=	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25

Water heating gains (Table 5)

(72)m=	49.28	47.72	44.48	40.07	37.21	33.18	29.75	34.14	35.7	40.26	45.42	47.73

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

(73)m=	231.34	229.82	221.59	208.5	195.59	182.84	174.36	178.71	185.25	198.5	213.7	224.73

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(76)
East	0.9x 0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(76)
East	0.9x 0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(76)
East	0.9x 0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(76)
East	0.9x 0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(76)
East	0.9x 0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(76)
East	0.9x 0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(76)
East	0.9x 0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(76)
East	0.9x 0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(76)
East	0.9x 0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(76)
East	0.9x 0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(76)
East	0.9x 0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(76)
South	0.9x 0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x 0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x 0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x 0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x 0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)
South	0.9x 0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x 0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x 0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)
South	0.9x 0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x 0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x 0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x 0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)
West	0.9x 0.77	x	1.7	x	19.64	x	0.63	x	0.7	=	10.2	(80)
West	0.9x 0.77	x	1.7	x	38.42	x	0.63	x	0.7	=	19.96	(80)
West	0.9x 0.77	x	1.7	x	63.27	x	0.63	x	0.7	=	32.87	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.7	x	92.28	x	0.63	x	0.7	=	47.94		(80)
West	0.9x	0.77	x	1.7	x	113.09	x	0.63	x	0.7	=	58.76		(80)
West	0.9x	0.77	x	1.7	x	115.77	x	0.63	x	0.7	=	60.15		(80)
West	0.9x	0.77	x	1.7	x	110.22	x	0.63	x	0.7	=	57.26		(80)
West	0.9x	0.77	x	1.7	x	94.68	x	0.63	x	0.7	=	49.19		(80)
West	0.9x	0.77	x	1.7	x	73.59	x	0.63	x	0.7	=	38.23		(80)
West	0.9x	0.77	x	1.7	x	45.59	x	0.63	x	0.7	=	23.69		(80)
West	0.9x	0.77	x	1.7	x	24.49	x	0.63	x	0.7	=	12.72		(80)
West	0.9x	0.77	x	1.7	x	16.15	x	0.63	x	0.7	=	8.39		(80)

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

(83)m=	57.42	104.29	157.39	215.48	257.03	261.26	249.41	218.01	177.72	119.47	70.02	48.3	(83)

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

(84)m=	288.76	334.12	378.98	423.98	452.62	444.11	423.77	396.71	362.97	317.97	283.71	273.03	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.93	0.85	0.72	0.55	0.41	0.45	0.68	0.89	0.96	0.98	(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=	20.47	20.47	20.48	20.48	20.49	20.49	20.49	20.5	20.49	20.49	20.48	20.48	(88)

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

(89)m=	0.98	0.96	0.92	0.84	0.69	0.51	0.37	0.41	0.65	0.88	0.96	0.98	(89)

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

(90)m=	20.47	20.47	20.48	20.48	20.49	20.49	20.49	20.5	20.49	20.49	20.48	20.48	(90)

fLA = Living area ÷ (4) = 0.48 (91)

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

(92)m=	20.72	20.72	20.72	20.73	20.73	20.73	20.73	20.74	20.73	20.73	20.73	20.73	(92)

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

(93)m=	20.72	20.72	20.72	20.73	20.73	20.73	20.73	20.74	20.73	20.73	20.73	20.73	(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	0.92	0.84	0.71	0.53	0.39	0.43	0.66	0.88	0.96	0.98	(94)

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

(95)m=	282.11	320.77	350.12	357.12	319.92	235.8	164.5	170.67	240.67	280.62	272.68	267.81	(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=	693.54	666.14	596.93	488.54	371.74	248.46	167.45	175.01	270.4	417.02	564.66	689.13	(97)

DER WorkSheet: New dwelling design stage

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

(98)m=	306.11	232.08	183.63	94.63	38.55	0	0	0	0	101.48	210.23	313.47

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1480.17 (98)

Space heating requirement in kWh/m²/year 37 (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 1 495.7 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	306.11	232.08	183.63	94.63	38.55	0	0	0	0	101.48	210.23	313.47	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	61.75	46.82	37.04	19.09	7.78	0	0	0	0	20.47	42.41	63.24	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 298.6 (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)

	124.34	109.15	113.59	100.38	97.32	85.45	80.64	90.46	90.91	104.15	111.95	120.86

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

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

(219)m=	64.03	56.21	58.5	51.69	50.12	44.01	41.53	46.58	46.82	53.64	57.65	62.24

Total = Sum(219a)$_{1...12}$ = 633.01 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		298.6
Water heating fuel used		633.01
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	102.42	(230a)
warm air heating system fans	55.2	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		157.62 (231)
Electricity for lighting		192.72 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1281.95 (338)

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

DER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	154.97	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	328.53	(264)
Space and water heating	(261) + (262) + (263) + (264) =				483.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	81.8	(267)
Electricity for lighting	(232) x		0.519	=	100.02	(268)
Total CO2, kg/year		sum of (265)…(271) =			665.33	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			16.63	(273)
EI rating (section 14)					90	(274)

Predicted Energy Assessment

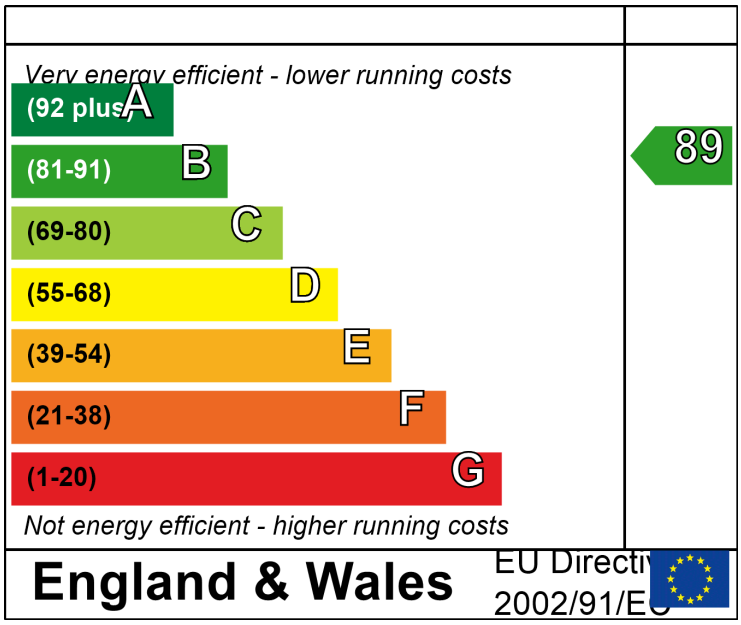
FLAT 02
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 40 m²

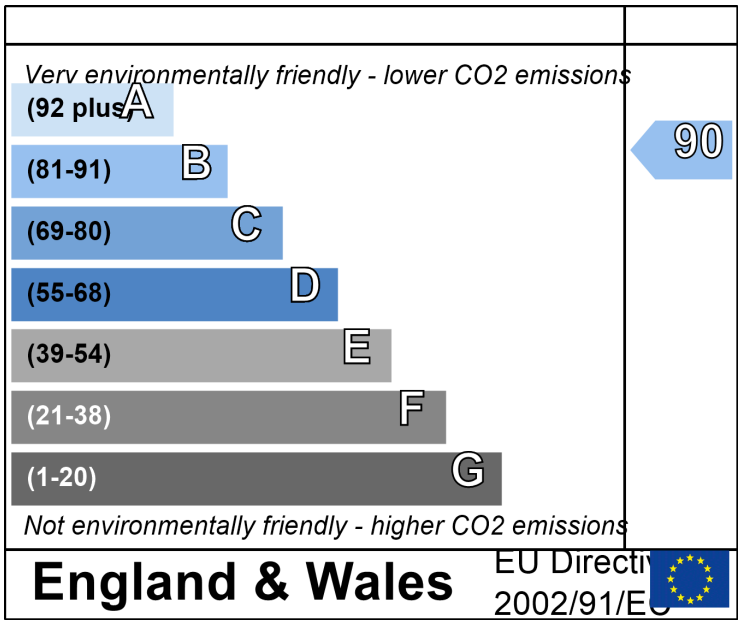
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 02

Address : FLAT 02, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	40	(1a) x	2.3	(2a) =	92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	40	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		92	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

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

(24a)m=

0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34

(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=

0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.13	=	0.273			(26)
Windows Type 1			1.7	x1/[1/(1.1)+ 0.04]		=	1.79			(27)
Windows Type 2			1.71	x1/[1/(1.1)+ 0.04]		=	1.8			(27)
Windows Type 3			1.71	x1/[1/(1.1)+ 0.04]		=	1.8			(27)
Windows Type 4			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Floor Type 1			6	x	0.1	=	0.6	20	120	(28)
Floor Type 2			34	x	0.18	=	6.12	20	680	(28)
Walls Type1	20.24	7.99	12.25	x	0.15	=	1.84	150	1837.5	(29)
Walls Type2	18.86	2.1	16.76	x	0.11	=	1.84	14	234.64	(29)
Roof	1.1	0	1.1	x	0.11	=	0.12	9	9.9	(30)
Total area of elements, m²			80.2							(31)
Party wall			57.04	x	0	=	0	20	1140.8	(32)
Party floor			34					30	1020	(32a)
Party ceiling			38.9					20	778	(32b)
Internal wall **			39.1					9	351.9	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 19.21 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6172.74 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 154.32 (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 — 12.03 (36)

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

Total fabric heat loss (33) + (36) = 31.24 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	10.99	10.85	10.72	10.06	9.92	9.26	9.26	9.13	9.53	9.92	10.19	10.46	(38)

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

(39)m=	42.23	42.1	41.96	41.3	41.17	40.5	40.5	40.37	40.77	41.17	41.43	41.7	

Average = Sum(39)$_{1...12}$ /12= 41.27 (39)

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

(40)m=	1.06	1.05	1.05	1.03	1.03	1.01	1.01	1.01	1.02	1.03	1.04	1.04	

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

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 1.41 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 67.6 (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=	74.36	71.66	68.95	66.25	63.54	60.84	60.84	63.54	66.25	68.95	71.66	74.36	

Total = Sum(44)$_{1...12}$ = 811.21 (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=	110.27	96.45	99.52	86.77	83.26	71.84	66.57	76.39	77.31	90.09	98.34	106.79	

Total = Sum(45)$_{1...12}$ = 1063.62 (45)

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

(46)m=	16.54	14.47	14.93	13.02	12.49	10.78	9.99	11.46	11.6	13.51	14.75	16.02	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	124.34	109.15	113.59	100.38	97.32	85.45	80.64	90.46	90.91	104.15	111.95	120.86	(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=	124.34	109.15	113.59	100.38	97.32	85.45	80.64	90.46	90.91	104.15	111.95	120.86	

Output from water heater (annual)$_{1...12}$ 1229.18 (64)

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

(65)m=	36.67	32.07	33.09	28.85	27.68	23.89	22.14	25.4	25.7	29.96	32.7	35.51	(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=	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	84.38	(66)

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

(67)m=	27.09	24.06	19.57	14.81	11.07	9.35	10.1	13.13	17.62	22.38	26.12	27.84	(67)

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

(68)m=	181.39	183.28	178.53	168.43	155.69	143.71	135.7	133.82	138.56	148.66	161.41	173.39	(68)

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

(69)m=	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	44.84	(69)

Pumps and fans gains (Table 5a)

(70)m=	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52	(70)

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

(71)m=	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	(71)

Water heating gains (Table 5)

(72)m=	49.28	47.72	44.48	40.07	37.21	33.18	29.75	34.14	35.7	40.26	45.42	47.73	(72)

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

(73)m=	336.25	333.55	321.07	301.81	282.46	264.72	254.05	259.58	270.38	289.79	311.43	327.45	(73)

6. Solar gains:

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

SAP WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	1	x	1.71	x	10.63	x	0.63	x	0.7	=	7.22	(74)
North	0.9x	1	x	1.71	x	20.32	x	0.63	x	0.7	=	13.79	(74)
North	0.9x	1	x	1.71	x	34.53	x	0.63	x	0.7	=	23.44	(74)
North	0.9x	1	x	1.71	x	55.46	x	0.63	x	0.7	=	37.64	(74)
North	0.9x	1	x	1.71	x	74.72	x	0.63	x	0.7	=	50.71	(74)
North	0.9x	1	x	1.71	x	79.99	x	0.63	x	0.7	=	54.29	(74)
North	0.9x	1	x	1.71	x	74.68	x	0.63	x	0.7	=	50.68	(74)
North	0.9x	1	x	1.71	x	59.25	x	0.63	x	0.7	=	40.21	(74)
North	0.9x	1	x	1.71	x	41.52	x	0.63	x	0.7	=	28.18	(74)
North	0.9x	1	x	1.71	x	24.19	x	0.63	x	0.7	=	16.42	(74)
North	0.9x	1	x	1.71	x	13.12	x	0.63	x	0.7	=	8.9	(74)
North	0.9x	1	x	1.71	x	8.86	x	0.63	x	0.7	=	6.02	(74)
East	0.9x	1	x	2.87	x	19.64	x	0.63	x	0.7	=	22.37	(76)
East	0.9x	1	x	2.87	x	38.42	x	0.63	x	0.7	=	43.76	(76)
East	0.9x	1	x	2.87	x	63.27	x	0.63	x	0.7	=	72.07	(76)
East	0.9x	1	x	2.87	x	92.28	x	0.63	x	0.7	=	105.12	(76)
East	0.9x	1	x	2.87	x	113.09	x	0.63	x	0.7	=	128.82	(76)
East	0.9x	1	x	2.87	x	115.77	x	0.63	x	0.7	=	131.87	(76)
East	0.9x	1	x	2.87	x	110.22	x	0.63	x	0.7	=	125.55	(76)
East	0.9x	1	x	2.87	x	94.68	x	0.63	x	0.7	=	107.85	(76)
East	0.9x	1	x	2.87	x	73.59	x	0.63	x	0.7	=	83.83	(76)
East	0.9x	1	x	2.87	x	45.59	x	0.63	x	0.7	=	51.93	(76)
East	0.9x	1	x	2.87	x	24.49	x	0.63	x	0.7	=	27.9	(76)
East	0.9x	1	x	2.87	x	16.15	x	0.63	x	0.7	=	18.4	(76)
South	0.9x	1	x	1.71	x	46.75	x	0.63	x	0.7	=	31.73	(78)
South	0.9x	1	x	1.71	x	76.57	x	0.63	x	0.7	=	51.97	(78)
South	0.9x	1	x	1.71	x	97.53	x	0.63	x	0.7	=	66.2	(78)
South	0.9x	1	x	1.71	x	110.23	x	0.63	x	0.7	=	74.82	(78)
South	0.9x	1	x	1.71	x	114.87	x	0.63	x	0.7	=	77.96	(78)
South	0.9x	1	x	1.71	x	110.55	x	0.63	x	0.7	=	75.03	(78)
South	0.9x	1	x	1.71	x	108.01	x	0.63	x	0.7	=	73.31	(78)
South	0.9x	1	x	1.71	x	104.89	x	0.63	x	0.7	=	71.19	(78)
South	0.9x	1	x	1.71	x	101.89	x	0.63	x	0.7	=	69.15	(78)
South	0.9x	1	x	1.71	x	82.59	x	0.63	x	0.7	=	56.05	(78)
South	0.9x	1	x	1.71	x	55.42	x	0.63	x	0.7	=	37.61	(78)
South	0.9x	1	x	1.71	x	40.4	x	0.63	x	0.7	=	27.42	(78)
West	0.9x	1	x	1.7	x	19.64	x	0.63	x	0.7	=	13.25	(80)
West	0.9x	1	x	1.7	x	38.42	x	0.63	x	0.7	=	25.92	(80)
West	0.9x	1	x	1.7	x	63.27	x	0.63	x	0.7	=	42.69	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	1	x	1.7	x	92.28	x	0.63	x	0.7	=	62.26	(80)
West	0.9x	1	x	1.7	x	113.09	x	0.63	x	0.7	=	76.31	(80)
West	0.9x	1	x	1.7	x	115.77	x	0.63	x	0.7	=	78.11	(80)
West	0.9x	1	x	1.7	x	110.22	x	0.63	x	0.7	=	74.37	(80)
West	0.9x	1	x	1.7	x	94.68	x	0.63	x	0.7	=	63.88	(80)
West	0.9x	1	x	1.7	x	73.59	x	0.63	x	0.7	=	49.65	(80)
West	0.9x	1	x	1.7	x	45.59	x	0.63	x	0.7	=	30.76	(80)
West	0.9x	1	x	1.7	x	24.49	x	0.63	x	0.7	=	16.52	(80)
West	0.9x	1	x	1.7	x	16.15	x	0.63	x	0.7	=	10.9	(80)

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

(83)m=	74.57	135.45	204.4	279.84	333.8	339.3	323.91	283.13	230.81	155.16	90.93	62.73	(83)

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

(84)m=	410.83	468.99	525.47	581.65	616.26	604.03	577.96	542.71	501.18	444.95	402.36	390.18	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.94	0.9	0.84	0.73	0.58	0.42	0.31	0.34	0.53	0.78	0.9	0.95	(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=	20.47	20.47	20.48	20.48	20.49	20.49	20.49	20.5	20.49	20.49	20.48	20.48	(88)

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

(89)m=	0.93	0.9	0.83	0.71	0.55	0.39	0.27	0.3	0.5	0.75	0.89	0.94	(89)

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

(90)m=	20.47	20.47	20.48	20.48	20.49	20.49	20.49	20.5	20.49	20.49	20.48	20.48	(90)

fLA = Living area ÷ (4) = 0.48 (91)

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

(92)m=	20.72	20.72	20.72	20.73	20.73	20.73	20.73	20.74	20.73	20.73	20.73	20.73	(92)

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

(93)m=	20.72	20.72	20.72	20.73	20.73	20.73	20.73	20.74	20.73	20.73	20.73	20.73	(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=	0.94	0.9	0.84	0.72	0.56	0.4	0.29	0.32	0.51	0.76	0.9	0.94	(94)

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

(95)m=	384.55	422.4	438.99	416.77	347.73	243.48	166.4	173.45	257.84	340.07	361.95	368.57	(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=	693.54	666.14	596.93	488.54	371.74	248.46	167.45	175.01	270.4	417.02	564.66	689.13	(97)

SAP WorkSheet: New dwelling design stage

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

(98)m=	229.89	163.79	117.5	51.68	17.86	0	0	0	0	57.25	145.95	238.5

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1022.42 (98)

Space heating requirement in kWh/m²/year 25.56 (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 1 495.7 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	229.89	163.79	117.5	51.68	17.86	0	0	0	0	57.25	145.95	238.5	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	46.38	33.04	23.7	10.43	3.6	0	0	0	0	11.55	29.44	48.11	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 206.26 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

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

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

Water heating

Output from water heater (calculated above)

	124.34	109.15	113.59	100.38	97.32	85.45	80.64	90.46	90.91	104.15	111.95	120.86

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

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

(219)m=	64.03	56.21	58.5	51.69	50.12	44.01	41.53	46.58	46.82	53.64	57.65	62.24

Total = Sum(219a)$_{1...12}$ = 633.01 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		206.26
Water heating fuel used		633.01
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	102.42	(230a)
warm air heating system fans	55.2	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		157.62 (231)
Electricity for lighting		191.35 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1188.23 (338)

10a. Fuel costs - individual heating systems:

SAP WorkSheet: New dwelling design stage

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		13.19	x 0.01 =	27.21	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	83.49	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	20.79	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	25.24	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				156.73	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.77	(257)
SAP rating (Section 12)	89.2	(258)

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

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	107.05	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	328.53	(264)
Space and water heating	(261) + (262) + (263) + (264) =				435.58	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	81.8	(267)
Electricity for lighting	(232) x		0.519	=	99.31	(268)
Total CO2, kg/year	sum of (265)...(271) =				616.69	(272)
CO2 emissions per m²	(272) ÷ (4) =				15.42	(273)
EI rating (section 14)					90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		3.07	=	633.21	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	1943.35	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2576.55	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	483.89	(267)

SAP WorkSheet: New dwelling design stage

Electricity for lighting	(232) x	0	=	587.43	(268)
'Total Primary Energy		sum of (265)…(271) =		3647.87	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		91.2	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 02

Address : FLAT 02, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	40	(1a) x	2.3	(2a) =	92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	40	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		92	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.22 (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)		0.47 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered			4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.33 (21)

Infiltration rate modified for monthly wind speed

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

TER WorkSheet: New dwelling design stage

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

0.42	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			1.68	x1/[1/(1.4)+ 0.04]		=	2.23			(27)
Windows Type 2			1.69	x1/[1/(1.4)+ 0.04]		=	2.24			(27)
Windows Type 3			1.69	x1/[1/(1.4)+ 0.04]		=	2.24			(27)
Windows Type 4			2.84	x1/[1/(1.4)+ 0.04]		=	3.77			(27)
Floor Type 1			6	x	0.13	=	0.78			(28)
Floor Type 2			34	x	0.13	=	4.42			(28)
Walls Type1	20.24	7.9	12.34	x	0.18	=	2.22			(29)
Walls Type2	18.86	2.1	16.76	x	0.18	=	3.02			(29)
Roof	1.1	0	1.1	x	0.13	=	0.14			(30)
Total area of elements, m²			80.2							(31)
Party wall			57.04	x	0	=	0			(32)
Party floor			34							(32a)
Party ceiling			38.9							(32b)
Internal wall **			39.1							(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 23.15 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6186.24 (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 — 4.01 (36)

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

Total fabric heat loss (33) + (36) = 27.16 (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=	17.82	17.72	17.62	17.15	17.06	16.65	16.65	16.57	16.8	17.06	17.24	17.42	(38)

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

(39)m=	44.99	44.88	44.78	44.31	44.22	43.81	43.81	43.73	43.97	44.22	44.4	44.59	

Average = Sum(39)$_{1...12}$ /12= 44.31 (39)

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

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

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 — 1.41 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 67.6 (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=	74.36	71.66	68.95	66.25	63.54	60.84	60.84	63.54	66.25	68.95	71.66	74.36	

Total = Sum(44)$_{1...12}$ = 811.21 (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=	110.27	96.45	99.52	86.77	83.26	71.84	66.57	76.39	77.31	90.09	98.34	106.79	

Total = Sum(45)$_{1...12}$ = 1063.62 (45)

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

(46)m=	16.54	14.47	14.93	13.02	12.49	10.78	9.99	11.46	11.6	13.51	14.75	16.02	(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): — 1.55 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0.84 (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)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0 (54)
Enter (50) or (54) in (55)		0.84 (55)

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

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98 (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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98 (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=	159.52	140.92	148.77	134.42	132.5	119.5	115.82	125.64	124.96	139.34	146	156.04 (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=	159.52	140.92	148.77	134.42	132.5	119.5	115.82	125.64	124.96	139.34	146	156.04

Output from water heater (annual)$_{1...12}$ 1643.41 (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=	76.06	67.65	72.49	66.97	67.08	62.01	61.53	64.8	63.83	69.35	70.82	74.9 (65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m=	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32	70.32 (66)

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

(67)m=	10.93	9.7	7.89	5.97	4.47	3.77	4.07	5.3	7.11	9.03	10.53	11.23 (67)

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

(68)m=	121.53	122.79	119.62	112.85	104.31	96.28	90.92	89.66	92.84	99.6	108.14	116.17 (68)

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

(69)m=	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03	30.03 (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=	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25	-56.25 (71)

Water heating gains (Table 5)

(72)m=	102.23	100.67	97.43	93.02	90.16	86.13	82.7	87.09	88.65	93.21	98.36	100.68 (72)

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

(73)m=	281.79	280.26	272.03	258.94	246.03	233.28	224.79	229.14	235.69	248.94	264.14	275.17 (73)

6. Solar gains:

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

TER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	1.69	x	10.63	x	0.63	x	0.7	=	5.49	(74)
North	0.9x 0.77	x	1.69	x	20.32	x	0.63	x	0.7	=	10.5	(74)
North	0.9x 0.77	x	1.69	x	34.53	x	0.63	x	0.7	=	17.83	(74)
North	0.9x 0.77	x	1.69	x	55.46	x	0.63	x	0.7	=	28.65	(74)
North	0.9x 0.77	x	1.69	x	74.72	x	0.63	x	0.7	=	38.59	(74)
North	0.9x 0.77	x	1.69	x	79.99	x	0.63	x	0.7	=	41.31	(74)
North	0.9x 0.77	x	1.69	x	74.68	x	0.63	x	0.7	=	38.57	(74)
North	0.9x 0.77	x	1.69	x	59.25	x	0.63	x	0.7	=	30.6	(74)
North	0.9x 0.77	x	1.69	x	41.52	x	0.63	x	0.7	=	21.44	(74)
North	0.9x 0.77	x	1.69	x	24.19	x	0.63	x	0.7	=	12.49	(74)
North	0.9x 0.77	x	1.69	x	13.12	x	0.63	x	0.7	=	6.78	(74)
North	0.9x 0.77	x	1.69	x	8.86	x	0.63	x	0.7	=	4.58	(74)
East	0.9x 0.77	x	2.84	x	19.64	x	0.63	x	0.7	=	17.05	(76)
East	0.9x 0.77	x	2.84	x	38.42	x	0.63	x	0.7	=	33.35	(76)
East	0.9x 0.77	x	2.84	x	63.27	x	0.63	x	0.7	=	54.92	(76)
East	0.9x 0.77	x	2.84	x	92.28	x	0.63	x	0.7	=	80.09	(76)
East	0.9x 0.77	x	2.84	x	113.09	x	0.63	x	0.7	=	98.16	(76)
East	0.9x 0.77	x	2.84	x	115.77	x	0.63	x	0.7	=	100.48	(76)
East	0.9x 0.77	x	2.84	x	110.22	x	0.63	x	0.7	=	95.66	(76)
East	0.9x 0.77	x	2.84	x	94.68	x	0.63	x	0.7	=	82.17	(76)
East	0.9x 0.77	x	2.84	x	73.59	x	0.63	x	0.7	=	63.87	(76)
East	0.9x 0.77	x	2.84	x	45.59	x	0.63	x	0.7	=	39.57	(76)
East	0.9x 0.77	x	2.84	x	24.49	x	0.63	x	0.7	=	21.26	(76)
East	0.9x 0.77	x	2.84	x	16.15	x	0.63	x	0.7	=	14.02	(76)
South	0.9x 0.77	x	1.69	x	46.75	x	0.63	x	0.7	=	24.15	(78)
South	0.9x 0.77	x	1.69	x	76.57	x	0.63	x	0.7	=	39.55	(78)
South	0.9x 0.77	x	1.69	x	97.53	x	0.63	x	0.7	=	50.37	(78)
South	0.9x 0.77	x	1.69	x	110.23	x	0.63	x	0.7	=	56.93	(78)
South	0.9x 0.77	x	1.69	x	114.87	x	0.63	x	0.7	=	59.33	(78)
South	0.9x 0.77	x	1.69	x	110.55	x	0.63	x	0.7	=	57.1	(78)
South	0.9x 0.77	x	1.69	x	108.01	x	0.63	x	0.7	=	55.79	(78)
South	0.9x 0.77	x	1.69	x	104.89	x	0.63	x	0.7	=	54.18	(78)
South	0.9x 0.77	x	1.69	x	101.89	x	0.63	x	0.7	=	52.62	(78)
South	0.9x 0.77	x	1.69	x	82.59	x	0.63	x	0.7	=	42.65	(78)
South	0.9x 0.77	x	1.69	x	55.42	x	0.63	x	0.7	=	28.62	(78)
South	0.9x 0.77	x	1.69	x	40.4	x	0.63	x	0.7	=	20.87	(78)
West	0.9x 0.77	x	1.68	x	19.64	x	0.63	x	0.7	=	10.08	(80)
West	0.9x 0.77	x	1.68	x	38.42	x	0.63	x	0.7	=	19.73	(80)
West	0.9x 0.77	x	1.68	x	63.27	x	0.63	x	0.7	=	32.49	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.68	x	92.28	x	0.63	x	0.7	=	47.38		(80)
West	0.9x	0.77	x	1.68	x	113.09	x	0.63	x	0.7	=	58.07		(80)
West	0.9x	0.77	x	1.68	x	115.77	x	0.63	x	0.7	=	59.44		(80)
West	0.9x	0.77	x	1.68	x	110.22	x	0.63	x	0.7	=	56.59		(80)
West	0.9x	0.77	x	1.68	x	94.68	x	0.63	x	0.7	=	48.61		(80)
West	0.9x	0.77	x	1.68	x	73.59	x	0.63	x	0.7	=	37.78		(80)
West	0.9x	0.77	x	1.68	x	45.59	x	0.63	x	0.7	=	23.41		(80)
West	0.9x	0.77	x	1.68	x	24.49	x	0.63	x	0.7	=	12.57		(80)
West	0.9x	0.77	x	1.68	x	16.15	x	0.63	x	0.7	=	8.29		(80)

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

(83)m=	56.77	103.11	155.61	213.05	254.14	258.33	246.61	215.56	175.72	118.12	69.23	47.75	(83)

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

(84)m=	338.56	383.38	427.64	471.99	500.17	491.61	471.4	444.7	411.41	367.06	333.36	322.93	(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	0.89	0.75	0.56	0.41	0.45	0.69	0.92	0.98	0.99	(86)

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

(87)m=	20.02	20.18	20.43	20.72	20.91	20.98	21	21	20.95	20.71	20.31	19.99	(87)

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

(88)m=	19.98	19.98	19.98	19.99	20	20	20	20.01	20	20	19.99	19.99	(88)

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

(89)m=	0.99	0.98	0.94	0.85	0.69	0.48	0.32	0.35	0.61	0.89	0.97	0.99	(89)

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

(90)m=	18.7	18.94	19.29	19.69	19.92	20	20	20	19.97	19.68	19.13	18.66	(90)

fLA = Living area ÷ (4) = 0.48 (91)

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

(92)m=	19.33	19.53	19.83	20.18	20.39	20.47	20.48	20.48	20.44	20.17	19.69	19.29	(92)

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

(93)m=	19.33	19.53	19.83	20.18	20.39	20.47	20.48	20.48	20.44	20.17	19.69	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	0.97	0.94	0.86	0.71	0.51	0.36	0.4	0.65	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	333.57	372.87	402.55	406.47	356.05	252.75	169.28	177.35	265.7	327.31	323.69	319.06	(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=	675.96	656.56	597.13	499.8	384.24	256.95	169.8	178.24	278.65	423.19	559.19	672.83	(97)

TER WorkSheet: New dwelling design stage

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

(98)m=	254.74	190.64	144.77	67.2	20.98	0	0	0	0	71.34	169.57	263.2

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1182.42 (98)

Space heating requirement in kWh/m²/year 29.56 (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)	254.74	190.64	144.77	67.2	20.98	0	0	0	0	71.34	169.57	263.2	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	272.45	203.89	154.83	71.87	22.44	0	0	0	0	76.3	181.35	281.5	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1264.62 (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)

	159.52	140.92	148.77	134.42	132.5	119.5	115.82	125.64	124.96	139.34	146	156.04

Efficiency of water heater 79.8 (216)

(217)m=	86.06	85.62	84.74	83.07	81.11	79.8	79.8	79.8	79.8	83.13	85.21	86.2

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

(219)m=	185.36	164.59	175.55	161.81	163.36	149.75	145.13	157.44	156.59	167.62	171.33	181.02

Total = Sum(219a)$_{1...12}$ = 1979.56 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1264.62
Water heating fuel used		1979.56
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		192.96 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3512.13 (338)

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

TER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	273.16	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	427.58	(264)
Space and water heating	(261) + (262) + (263) + (264) =				700.74	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	100.14	(268)
Total CO2, kg/year		sum of (265)…(271) =			839.81	(272)

TER = 30.63 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:27

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 38m²

Site Reference : 43LS **Plot Reference:** FLAT 03

Address : FLAT 03, 43 London Street, Reading, RG1 4PS

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)	29.03 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.53 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	37.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	32.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.15 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	0.81 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

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

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	1.7m²
Windows facing: East	3.11m²
Ventilation rate:	6.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.13 W/m²K
External Walls U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 03

Address : FLAT 03, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	38 (1a)	x	2.3 (2a)	=	87.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	38 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		87.4	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(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) =	0.19	(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

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

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) = 72.25 (23c)

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

(24a)m=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37	(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=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.13	=	0.273			(26)
Windows Type 1			1.7	x1/[1/(1.1)+ 0.04]		=	1.79			(27)
Windows Type 2			3.11	x1/[1/(1.1)+ 0.04]		=	3.28			(27)
Walls Type1	23.23	4.81	18.42	x	0.15	=	2.76	150	2763	(29)
Walls Type2	19.55	2.1	17.45	x	0.11	=	1.92	14	244.3	(29)
Roof	5.6	0	5.6	x	0.13	=	0.73	9	50.4	(30)
Total area of elements, m²			48.38							(31)
Party wall			48.99	x	0	=	0	20	979.8	(32)
Party floor			38					30	1140	(32a)
Party ceiling			32.4					20	648	(32b)
Internal wall **			39.1					9	351.9	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 10.75 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6177.4 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 162.56 (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 7.26 (36)

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

Total fabric heat loss (33) + (36) = 18.01 (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=	11.13	10.99	10.85	10.15	10.01	9.31	9.31	9.17	9.59	10.01	10.29	10.57	(38)

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

(39)m=	29.14	29	28.86	28.16	28.02	27.32	27.32	27.18	27.6	28.02	28.3	28.58	

Average = Sum(39)$_{1...12}$ /12= 28.12 (39)

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

(40)m=	0.77	0.76	0.76	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74	0.75	

Average = Sum(40)$_{1...12}$ /12= 0.74 (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 1.35 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 66.36 (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=	73	70.35	67.69	65.04	62.38	59.73	59.73	62.38	65.04	67.69	70.35	73	

Total = Sum(44)$_{1...12}$ = 796.36 (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=	108.26	94.68	97.7	85.18	81.73	70.53	65.36	75	75.89	88.44	96.54	104.84	

Total = Sum(45)$_{1...12}$ = 1044.16 (45)

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

(46)m=	16.24	14.2	14.66	12.78	12.26	10.58	9.8	11.25	11.38	13.27	14.48	15.73	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

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

Enter (50) or (54) in (55) 0.45 (55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	122.32	107.38	111.76	98.79	95.79	84.14	79.42	89.06	89.5	102.51	110.15	118.9	(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=	122.32	107.38	111.76	98.79	95.79	84.14	79.42	89.06	89.5	102.51	110.15	118.9	

Output from water heater (annual)$_{1...12}$ — 1209.72 — (64)

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

(65)m=	36	31.48	32.49	28.32	27.18	23.45	21.73	24.94	25.23	29.41	32.1	34.86	(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=	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	(66)

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

(67)m=	11.4	10.12	8.23	6.23	4.66	3.93	4.25	5.52	7.41	9.41	10.99	11.71	(67)

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

(68)m=	116.54	117.75	114.7	108.21	100.02	92.33	87.18	85.98	89.02	95.51	103.7	111.4	(68)

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

(69)m=	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	(69)

Pumps and fans gains (Table 5a)

(70)m=	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	(70)

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

(71)m=	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	(71)

Water heating gains (Table 5)

(72)m=	48.38	46.85	43.66	39.34	36.53	32.57	29.21	33.52	35.05	39.53	44.58	46.85	(72)

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

(73)m=	224.87	223.28	215.15	202.34	189.77	177.39	169.2	173.57	180.04	193.01	207.83	218.52	(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	3.11	x	19.64	x	0.63	x	0.7	=	18.67		(76)
East	0.9x	0.77	x	3.11	x	38.42	x	0.63	x	0.7	=	36.52		(76)
East	0.9x	0.77	x	3.11	x	63.27	x	0.63	x	0.7	=	60.14		(76)
East	0.9x	0.77	x	3.11	x	92.28	x	0.63	x	0.7	=	87.71		(76)
East	0.9x	0.77	x	3.11	x	113.09	x	0.63	x	0.7	=	107.49		(76)
East	0.9x	0.77	x	3.11	x	115.77	x	0.63	x	0.7	=	110.03		(76)
East	0.9x	0.77	x	3.11	x	110.22	x	0.63	x	0.7	=	104.76		(76)
East	0.9x	0.77	x	3.11	x	94.68	x	0.63	x	0.7	=	89.99		(76)
East	0.9x	0.77	x	3.11	x	73.59	x	0.63	x	0.7	=	69.94		(76)
East	0.9x	0.77	x	3.11	x	45.59	x	0.63	x	0.7	=	43.33		(76)
East	0.9x	0.77	x	3.11	x	24.49	x	0.63	x	0.7	=	23.28		(76)
East	0.9x	0.77	x	3.11	x	16.15	x	0.63	x	0.7	=	15.35		(76)
West	0.9x	0.77	x	1.7	x	19.64	x	0.63	x	0.7	=	10.2		(80)
West	0.9x	0.77	x	1.7	x	38.42	x	0.63	x	0.7	=	19.96		(80)
West	0.9x	0.77	x	1.7	x	63.27	x	0.63	x	0.7	=	32.87		(80)
West	0.9x	0.77	x	1.7	x	92.28	x	0.63	x	0.7	=	47.94		(80)
West	0.9x	0.77	x	1.7	x	113.09	x	0.63	x	0.7	=	58.76		(80)
West	0.9x	0.77	x	1.7	x	115.77	x	0.63	x	0.7	=	60.15		(80)
West	0.9x	0.77	x	1.7	x	110.22	x	0.63	x	0.7	=	57.26		(80)
West	0.9x	0.77	x	1.7	x	94.68	x	0.63	x	0.7	=	49.19		(80)
West	0.9x	0.77	x	1.7	x	73.59	x	0.63	x	0.7	=	38.23		(80)
West	0.9x	0.77	x	1.7	x	45.59	x	0.63	x	0.7	=	23.69		(80)
West	0.9x	0.77	x	1.7	x	24.49	x	0.63	x	0.7	=	12.72		(80)
West	0.9x	0.77	x	1.7	x	16.15	x	0.63	x	0.7	=	8.39		(80)

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

(83)m=	28.87	56.48	93.01	135.65	166.25	170.18	162.02	139.17	108.18	67.02	36	23.74

(83)

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

(84)m=	253.74	279.75	308.17	337.99	356.01	347.57	331.22	312.75	288.22	260.02	243.83	242.26

(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(86)m=	0.98	0.97	0.93	0.84	0.68	0.5	0.36	0.4	0.63	0.88	0.96	0.98

(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=	20.62	20.62	20.62	20.63	20.63	20.64	20.64	20.64	20.64	20.63	20.63	20.62

(88)

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

(89)m=	0.98	0.96	0.92	0.83	0.66	0.47	0.33	0.37	0.6	0.87	0.96	0.98

(89)

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

DER WorkSheet: New dwelling design stage

(90)m=	20.62	20.62	20.62	20.63	20.63	20.64	20.64	20.64	20.64	20.63	20.63	20.62	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	20.8	20.8	20.8	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.8	20.8	(92)

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

(93)m=	20.8	20.8	20.8	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.8	20.8	(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	0.93	0.83	0.67	0.48	0.35	0.38	0.62	0.87	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	248.48	269.95	285.96	281.07	239.82	167.54	114.72	119.41	177.88	226.9	234.54	238.08	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	480.68	461.01	412.64	335.21	255.13	169.67	115.04	119.91	185.15	285.95	387.78	474.43	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	172.76	128.39	94.25	38.98	11.39	0	0	0	0	43.93	110.33	175.84	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 775.88 (98)

Space heating requirement in kWh/m²/year 20.42 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 476.71 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	172.76	128.39	94.25	38.98	11.39	0	0	0	0	43.93	110.33	175.84	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	36.24	26.93	19.77	8.18	2.39	0	0	0	0	9.22	23.14	36.89	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 162.76 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

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

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

Water heating

Output from water heater (calculated above)

	122.32	107.38	111.76	98.79	95.79	84.14	79.42	89.06	89.5	102.51	110.15	118.9

Efficiency of water heater 194.18 (216)

DER WorkSheet: New dwelling design stage

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

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

(219)m=	62.99	55.3	57.56	50.87	49.33	43.33	40.9	45.86	46.09	52.79	56.73	61.23	

Total = Sum(219a)$_{1...12}$ = 622.99 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		162.76	
Water heating fuel used		622.99	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	97.3		(230a)
warm air heating system fans	52.44		(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	149.74	(231)
Electricity for lighting		201.26	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1136.75	(338)

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

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	84.47	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	323.33	(264)
Space and water heating	(261) + (262) + (263) + (264) =				407.8	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	77.71	(267)
Electricity for lighting	(232) x		0.519	=	104.45	(268)
Total CO2, kg/year		sum of (265)…(271) =			589.97	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			15.53	(273)
EI rating (section 14)					90	(274)

Predicted Energy Assessment

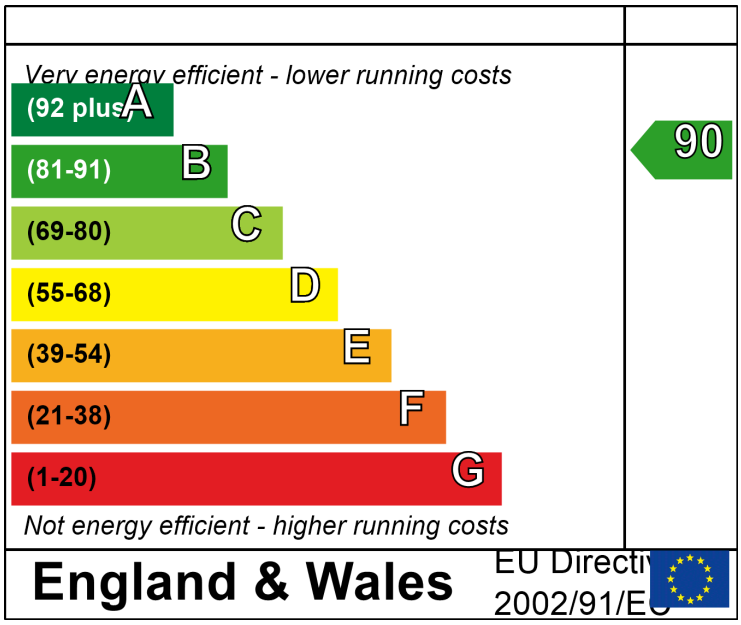
FLAT 03
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 38 m²

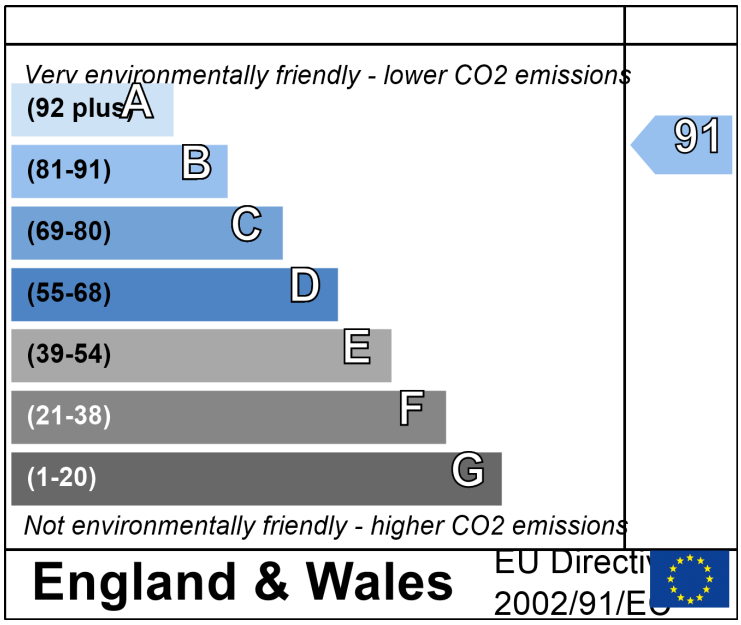
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 03

Address : FLAT 03, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	38	(1a) x	2.3	(2a) =	87.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	38	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		87.4	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (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) =			0.19 (21)

Infiltration rate modified for monthly wind speed

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

SAP WorkSheet: New dwelling design stage

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

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

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) = 72.25 (23c)

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

(24a)m=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37	(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=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.13	=	0.273			(26)
Windows Type 1			1.7	x	1/[1/(1.1)+ 0.04]	=	1.79			(27)
Windows Type 2			3.11	x	1/[1/(1.1)+ 0.04]	=	3.28			(27)
Walls Type1	23.23	4.81	18.42	x	0.15	=	2.76	150	2763	(29)
Walls Type2	19.55	2.1	17.45	x	0.11	=	1.92	14	244.3	(29)
Roof	5.6	0	5.6	x	0.13	=	0.73	9	50.4	(30)
Total area of elements, m²			48.38							(31)
Party wall			48.99	x	0	=	0	20	979.8	(32)
Party floor			38					30	1140	(32a)
Party ceiling			32.4					20	648	(32b)
Internal wall **			39.1					9	351.9	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 10.75 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6177.4 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 162.56 (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 7.26 (36)

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

Total fabric heat loss (33) + (36) = 18.01 (37)

SAP 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=	11.13	10.99	10.85	10.15	10.01	9.31	9.31	9.17	9.59	10.01	10.29	10.57	(38)

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

(39)m=	29.14	29	28.86	28.16	28.02	27.32	27.32	27.18	27.6	28.02	28.3	28.58	

Average = Sum(39)$_{1...12}$ /12= 28.12 (39)

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

(40)m=	0.77	0.76	0.76	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74	0.75	

Average = Sum(40)$_{1...12}$ /12= 0.74 (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 1.35 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 66.36 (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=	73	70.35	67.69	65.04	62.38	59.73	59.73	62.38	65.04	67.69	70.35	73	

Total = Sum(44)$_{1...12}$ = 796.36 (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=	108.26	94.68	97.7	85.18	81.73	70.53	65.36	75	75.89	88.44	96.54	104.84	

Total = Sum(45)$_{1...12}$ = 1044.16 (45)

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

(46)m=	16.24	14.2	14.66	12.78	12.26	10.58	9.8	11.25	11.38	13.27	14.48	15.73	(46)

Water storage loss:

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

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

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

Enter (50) or (54) in (55) 0.45 (55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	122.32	107.38	111.76	98.79	95.79	84.14	79.42	89.06	89.5	102.51	110.15	118.9	(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=	122.32	107.38	111.76	98.79	95.79	84.14	79.42	89.06	89.5	102.51	110.15	118.9	

Output from water heater (annual)$_{1...12}$ — 1209.72 — (64)

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

(65)m=	36	31.48	32.49	28.32	27.18	23.45	21.73	24.94	25.23	29.41	32.1	34.86	(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=	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	(66)

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

(67)m=	27.36	24.3	19.76	14.96	11.18	9.44	10.2	13.26	17.8	22.6	26.38	28.12	(67)

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

(68)m=	173.94	175.74	171.19	161.51	149.29	137.8	130.13	128.32	132.87	142.55	154.78	166.26	(68)

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

(69)m=	44.48	44.48	44.48	44.48	44.48	44.48	44.48	44.48	44.48	44.48	44.48	44.48	(69)

Pumps and fans gains (Table 5a)

(70)m=	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	5.24	(70)

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

(71)m=	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	(71)

Water heating gains (Table 5)

(72)m=	48.38	46.85	43.66	39.34	36.53	32.57	29.21	33.52	35.05	39.53	44.58	46.85	(72)

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

(73)m=	326.49	323.7	311.43	292.62	273.81	256.62	246.35	251.91	262.53	281.49	302.55	318.05	(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)

SAP WorkSheet: New dwelling design stage

East	0.9x	1	x	3.11	x	19.64	x	0.63	x	0.7	=	24.24	(76)
East	0.9x	1	x	3.11	x	38.42	x	0.63	x	0.7	=	47.42	(76)
East	0.9x	1	x	3.11	x	63.27	x	0.63	x	0.7	=	78.1	(76)
East	0.9x	1	x	3.11	x	92.28	x	0.63	x	0.7	=	113.91	(76)
East	0.9x	1	x	3.11	x	113.09	x	0.63	x	0.7	=	139.6	(76)
East	0.9x	1	x	3.11	x	115.77	x	0.63	x	0.7	=	142.9	(76)
East	0.9x	1	x	3.11	x	110.22	x	0.63	x	0.7	=	136.05	(76)
East	0.9x	1	x	3.11	x	94.68	x	0.63	x	0.7	=	116.86	(76)
East	0.9x	1	x	3.11	x	73.59	x	0.63	x	0.7	=	90.84	(76)
East	0.9x	1	x	3.11	x	45.59	x	0.63	x	0.7	=	56.27	(76)
East	0.9x	1	x	3.11	x	24.49	x	0.63	x	0.7	=	30.23	(76)
East	0.9x	1	x	3.11	x	16.15	x	0.63	x	0.7	=	19.94	(76)
West	0.9x	1	x	1.7	x	19.64	x	0.63	x	0.7	=	13.25	(80)
West	0.9x	1	x	1.7	x	38.42	x	0.63	x	0.7	=	25.92	(80)
West	0.9x	1	x	1.7	x	63.27	x	0.63	x	0.7	=	42.69	(80)
West	0.9x	1	x	1.7	x	92.28	x	0.63	x	0.7	=	62.26	(80)
West	0.9x	1	x	1.7	x	113.09	x	0.63	x	0.7	=	76.31	(80)
West	0.9x	1	x	1.7	x	115.77	x	0.63	x	0.7	=	78.11	(80)
West	0.9x	1	x	1.7	x	110.22	x	0.63	x	0.7	=	74.37	(80)
West	0.9x	1	x	1.7	x	94.68	x	0.63	x	0.7	=	63.88	(80)
West	0.9x	1	x	1.7	x	73.59	x	0.63	x	0.7	=	49.65	(80)
West	0.9x	1	x	1.7	x	45.59	x	0.63	x	0.7	=	30.76	(80)
West	0.9x	1	x	1.7	x	24.49	x	0.63	x	0.7	=	16.52	(80)
West	0.9x	1	x	1.7	x	16.15	x	0.63	x	0.7	=	10.9	(80)

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

(83)m=	37.5	73.35	120.79	176.17	215.9	221.02	210.42	180.74	140.49	87.03	46.75	30.83	(83)

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

(84)m=	363.98	397.05	432.23	468.79	489.71	477.64	456.76	432.65	403.02	368.52	349.3	348.88	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.93	0.89	0.82	0.68	0.52	0.36	0.26	0.29	0.47	0.72	0.88	0.94	(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=	20.62	20.62	20.62	20.63	20.63	20.64	20.64	20.64	20.64	20.63	20.63	20.62	(88)

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

(89)m=	0.92	0.88	0.81	0.66	0.5	0.34	0.24	0.27	0.44	0.71	0.87	0.93	(89)

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

SAP WorkSheet: New dwelling design stage

(90)m=	20.62	20.62	20.62	20.63	20.63	20.64	20.64	20.64	20.64	20.63	20.63	20.62	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	20.8	20.8	20.8	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.8	20.8	(92)

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

(93)m=	20.8	20.8	20.8	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.8	20.8	(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=	0.92	0.89	0.81	0.67	0.51	0.35	0.25	0.28	0.45	0.72	0.87	0.93	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	336.18	352.33	351.17	315.1	250.6	169.16	114.97	119.8	183.31	263.51	305.6	325.33	(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=	480.68	461.01	412.64	335.21	255.13	169.67	115.04	119.91	185.15	285.95	387.78	474.43	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	107.51	73.03	45.74	14.48	3.37	0	0	0	0	16.7	59.17	110.93	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 430.93 (98)

Space heating requirement in kWh/m²/year 11.34 (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 1 476.71 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	107.51	73.03	45.74	14.48	3.37	0	0	0	0	16.7	59.17	110.93	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	22.55	15.32	9.59	3.04	0.71	0	0	0	0	3.5	12.41	23.27	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 90.4 (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)

	122.32	107.38	111.76	98.79	95.79	84.14	79.42	89.06	89.5	102.51	110.15	118.9

Efficiency of water heater 194.18 (216)

SAP WorkSheet: New dwelling design stage

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

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

(219)m=	62.99	55.3	57.56	50.87	49.33	43.33	40.9	45.86	46.09	52.79	56.73	61.23	

Total = Sum(219a)$_{1...12}$ = 622.99 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		90.4	
Water heating fuel used		622.99	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	97.3		(230a)
warm air heating system fans	52.44		(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	149.74	(231)
Electricity for lighting		193.29	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1056.41	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211)	x	13.19	x 0.01 =	11.92	(240)
Space heating - main system 2	(213)	x	0	x 0.01 =	0	(241)
Space heating - secondary	(215)	x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	82.17	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	19.75	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	25.49	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				139.34	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.71	(257)
SAP rating (Section 12)	90.16	(258)

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

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.519	=	46.92	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	323.33	(264)

SAP WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			370.25	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	77.71	(267)
Electricity for lighting	(232) x	0.519	=	100.32	(268)
Total CO2, kg/year	sum of (265)…(271) =			548.28	(272)
CO2 emissions per m²	(272) ÷ (4) =			14.43	(273)
EI rating (section 14)				91	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	277.52	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	1912.58	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2190.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	459.7	(267)
Electricity for lighting	(232) x	0	=	593.4	(268)
'Total Primary Energy	sum of (265)…(271) =			3243.19	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			85.35	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 03

Address : FLAT 03, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	38 (1a)	x	2.3 (2a)	=	87.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	38 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		87.4	(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) =	0.23	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.48	(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) =	0.37	(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

TER WorkSheet: New dwelling design stage

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

0.47	0.46	0.45	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	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			1.7	x	1/[1/(1.4)+ 0.04]	=	2.25			(27)
Windows Type 2			3.11	x	1/[1/(1.4)+ 0.04]	=	4.12			(27)
Walls Type1	23.23	4.81	18.42	x	0.18	=	3.32			(29)
Walls Type2	19.55	2.1	17.45	x	0.18	=	3.14			(29)
Roof	5.6	0	5.6	x	0.13	=	0.73			(30)
Total area of elements, m²			48.38							(31)
Party wall			48.99	x	0	=	0			(32)
Party floor			38							(32a)
Party ceiling			32.4							(32b)
Internal wall **			39.1							(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 15.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6177.4 (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 2.42 (36)

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

Total fabric heat loss (33) + (36) = 18.08 (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=	17.65	17.52	17.4	16.82	16.72	16.21	16.21	16.12	16.41	16.72	16.93	17.16	(38)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(39)m=	35.73	35.6	35.48	34.9	34.8	34.29	34.29	34.2	34.49	34.8	35.01	35.24	

Average = Sum(39)$_{1...12}$ /12= 34.9 (39)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(40)m=	0.94	0.94	0.93	0.92	0.92	0.9	0.9	0.9	0.91	0.92	0.92	0.93	

Average = Sum(40)$_{1...12}$ /12= 0.92 (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 1.35 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 66.36 (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=	73	70.35	67.69	65.04	62.38	59.73	59.73	62.38	65.04	67.69	70.35	73	

Total = Sum(44)$_{1...12}$ = 796.36 (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=	108.26	94.68	97.7	85.18	81.73	70.53	65.36	75	75.89	88.44	96.54	104.84	

Total = Sum(45)$_{1...12}$ = 1044.16 (45)

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

(46)m=	16.24	14.2	14.66	12.78	12.26	10.58	9.8	11.25	11.38	13.27	14.48	15.73	(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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (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) 0.84 (55)

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

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(56)

TER WorkSheet: New dwelling design stage

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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	157.5	139.16	146.95	132.83	130.98	118.18	114.6	124.24	123.55	137.69	144.2	154.08	(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=	157.5	139.16	146.95	132.83	130.98	118.18	114.6	124.24	123.55	137.69	144.2	154.08	

Output from water heater (annual)$_{1...12}$ — 1623.95 — (64)

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

(65)m=	75.39	67.06	71.88	66.45	66.57	61.57	61.12	64.33	63.36	68.8	70.22	74.25	(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=	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	67.71	(66)

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

(67)m=	11.4	10.12	8.23	6.23	4.66	3.93	4.25	5.52	7.41	9.41	10.99	11.71	(67)

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

(68)m=	116.54	117.75	114.7	108.21	100.02	92.33	87.18	85.98	89.02	95.51	103.7	111.4	(68)

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

(69)m=	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	29.77	(69)

Pumps and fans gains (Table 5a)

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

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

(71)m=	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	-54.17	(71)

Water heating gains (Table 5)

(72)m=	101.33	99.8	96.61	92.29	89.48	85.52	82.16	86.47	88	92.48	97.53	99.8	(72)

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

(73)m=	275.58	273.98	265.86	253.04	240.47	228.09	219.9	224.28	230.75	243.71	258.53	269.23	(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)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	3.11	x	19.64	x	0.63	x	0.7	=	18.67	(76)
East	0.9x	0.77	x	3.11	x	38.42	x	0.63	x	0.7	=	36.52	(76)
East	0.9x	0.77	x	3.11	x	63.27	x	0.63	x	0.7	=	60.14	(76)
East	0.9x	0.77	x	3.11	x	92.28	x	0.63	x	0.7	=	87.71	(76)
East	0.9x	0.77	x	3.11	x	113.09	x	0.63	x	0.7	=	107.49	(76)
East	0.9x	0.77	x	3.11	x	115.77	x	0.63	x	0.7	=	110.03	(76)
East	0.9x	0.77	x	3.11	x	110.22	x	0.63	x	0.7	=	104.76	(76)
East	0.9x	0.77	x	3.11	x	94.68	x	0.63	x	0.7	=	89.99	(76)
East	0.9x	0.77	x	3.11	x	73.59	x	0.63	x	0.7	=	69.94	(76)
East	0.9x	0.77	x	3.11	x	45.59	x	0.63	x	0.7	=	43.33	(76)
East	0.9x	0.77	x	3.11	x	24.49	x	0.63	x	0.7	=	23.28	(76)
East	0.9x	0.77	x	3.11	x	16.15	x	0.63	x	0.7	=	15.35	(76)
West	0.9x	0.77	x	1.7	x	19.64	x	0.63	x	0.7	=	10.2	(80)
West	0.9x	0.77	x	1.7	x	38.42	x	0.63	x	0.7	=	19.96	(80)
West	0.9x	0.77	x	1.7	x	63.27	x	0.63	x	0.7	=	32.87	(80)
West	0.9x	0.77	x	1.7	x	92.28	x	0.63	x	0.7	=	47.94	(80)
West	0.9x	0.77	x	1.7	x	113.09	x	0.63	x	0.7	=	58.76	(80)
West	0.9x	0.77	x	1.7	x	115.77	x	0.63	x	0.7	=	60.15	(80)
West	0.9x	0.77	x	1.7	x	110.22	x	0.63	x	0.7	=	57.26	(80)
West	0.9x	0.77	x	1.7	x	94.68	x	0.63	x	0.7	=	49.19	(80)
West	0.9x	0.77	x	1.7	x	73.59	x	0.63	x	0.7	=	38.23	(80)
West	0.9x	0.77	x	1.7	x	45.59	x	0.63	x	0.7	=	23.69	(80)
West	0.9x	0.77	x	1.7	x	24.49	x	0.63	x	0.7	=	12.72	(80)
West	0.9x	0.77	x	1.7	x	16.15	x	0.63	x	0.7	=	8.39	(80)

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

(83)m=	28.87	56.48	93.01	135.65	166.25	170.18	162.02	139.17	108.18	67.02	36	23.74

(83)

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

(84)m=	304.45	330.46	358.87	388.7	406.72	398.28	381.93	363.45	338.92	310.73	294.53	292.97

(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	0.96	0.89	0.74	0.54	0.39	0.43	0.68	0.91	0.98	0.99

(86)

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

(87)m=	20.24	20.36	20.56	20.8	20.95	20.99	21	21	20.98	20.8	20.49	20.22

(87)

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

(88)m=	20.13	20.14	20.14	20.15	20.15	20.17	20.17	20.17	20.16	20.15	20.15	20.14

(88)

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

(89)m=	0.99	0.98	0.95	0.86	0.69	0.48	0.32	0.35	0.6	0.89	0.97	0.99

(89)

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

TER WorkSheet: New dwelling design stage

(90)m=	19.14	19.31	19.6	19.93	20.11	20.16	20.17	20.17	20.14	19.94	19.51	19.12	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.66	19.81	20.06	20.35	20.5	20.56	20.56	20.56	20.54	20.35	19.97	19.64	(92)

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

(93)m=	19.66	19.81	20.06	20.35	20.5	20.56	20.56	20.56	20.54	20.35	19.97	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	0.98	0.95	0.87	0.71	0.51	0.36	0.39	0.64	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	300.25	322.7	340.58	337.96	290.64	202.56	135.66	142.03	215.95	277.45	286.25	289.62	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	548.81	530.82	481.02	399.52	306.35	204.23	135.81	142.31	222.06	339.12	450.72	544.23	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	184.93	139.86	104.49	44.33	11.69	0	0	0	0	45.88	118.42	189.44	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 839.03 (98)

Space heating requirement in kWh/m²/year 22.08 (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)													
	184.93	139.86	104.49	44.33	11.69	0	0	0	0	45.88	118.42	189.44	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	197.79	149.58	111.75	47.41	12.51	0	0	0	0	49.07	126.65	202.61	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 897.36 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

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

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

Water heating

Output from water heater (calculated above)

	157.5	139.16	146.95	132.83	130.98	118.18	114.6	124.24	123.55	137.69	144.2	154.08

Efficiency of water heater 79.8 (216)

TER WorkSheet: New dwelling design stage

(217)m=	85.24	84.83	83.92	82.23	80.58	79.8	79.8	79.8	79.8	82.23	84.29	85.37

(217)

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

(219)m=	184.77	164.05	175.1	161.53	162.54	148.1	143.61	155.69	154.82	167.44	171.07	180.5

Total = Sum(219a)$_{1...12}$ = 1969.2 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		897.36	
Water heating fuel used		1969.2	
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		201.26	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3142.83	(338)

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

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	193.83	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	425.35	(264)
Space and water heating	(261) + (262) + (263) + (264) =				619.18	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	104.45	(268)
Total CO2, kg/year		sum of (265)…(271) =			762.56	(272)

TER = 29.03 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:24

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Maisonette

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 48.3m²

Site Reference : 43LS **Plot Reference:** FLAT 04

Address : FLAT 04, 43 London Street, Reading, RG1 4PS

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)	29.42 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.21 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	0.98 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

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

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Very Little
Windows facing: West	6.67m²
Windows facing: East	3.11m²
Windows facing: West	3.76m²
Windows facing: East	1.5m²
Ventilation rate:	8.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.13 W/m²K
Roofs U-value	0.11 W/m²K
External Walls U-value	0.12 W/m²K
External Walls U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 04

Address : FLAT 04, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	36.4 (1a)	x	2.25 (2a)	=	81.9	(3a)
First floor	11.9 (1b)	x	2.4 (2b)	=	28.56	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	48.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		110.46	(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			5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.25 (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) =		0.19 (21)

Infiltration rate modified for monthly wind speed

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

Monthly average wind speed from Table 7

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

DER WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

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

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

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

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) = 72.25 (23c)

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

(24a)m=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37

(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=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.13	=	0.273			(26)
Windows Type 1			6.67	x1/[1/(1.1)+ 0.04]		=	7.03			(27)
Windows Type 2			3.11	x1/[1/(1.1)+ 0.04]		=	3.28			(27)
Windows Type 3			3.76	x1/[1/(1.1)+ 0.04]		=	3.96			(27)
Windows Type 4			1.5	x1/[1/(1.1)+ 0.04]		=	1.58			(27)
Walls Type1	64.84	15.04	49.8	x	0.12	=	5.98	14	697.2	(29)
Walls Type2	5.98	2.1	3.88	x	0.11	=	0.43	14	54.32	(29)
Roof Type1	21.4	0	21.4	x	0.11	=	2.35	9	192.6	(30)
Roof Type2	11.9	0	11.9	x	0.11	=	1.31	9	107.1	(30)
Total area of elements, m²			104.12							(31)
Party wall			35.65	x	0	=	0	20	713	(32)
Party floor			36.4					30	1092	(32a)
Internal wall **			67.16					9	604.4401	(32c)
Internal floor			11.9					18	214.2	(32d)
Internal ceiling			11.9					9	107.1	(32e)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 26.19 (33)

DER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3781.96 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 78.3 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 15.62 (36)

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

Total fabric heat loss (33) + (36) = 41.8 (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=	14.06	13.89	13.71	12.83	12.65	11.77	11.77	11.59	12.12	12.65	13	13.36	(38)

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

(39)m=	55.87	55.69	55.51	54.63	54.45	53.57	53.57	53.39	53.92	54.45	54.81	55.16	

Average = Sum(39)$_{1...12}$ /12= 54.59 (39)

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

(40)m=	1.16	1.15	1.15	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.13	1.14	

Average = Sum(40)$_{1...12}$ /12= 1.13 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.64 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 73.15 (43)

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

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

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

(44)m=	80.47	77.54	74.62	71.69	68.77	65.84	65.84	68.77	71.69	74.62	77.54	80.47	

Total = Sum(44)$_{1...12}$ = 877.85 (44)

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

(45)m=	119.33	104.37	107.7	93.9	90.1	77.75	72.04	82.67	83.66	97.5	106.42	115.57	

Total = Sum(45)$_{1...12}$ = 1151 (45)

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

(46)m=	17.9	15.66	16.16	14.08	13.51	11.66	10.81	12.4	12.55	14.62	15.96	17.34	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

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

DER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	133.4	117.07	121.76	107.5	104.16	91.35	86.1	96.73	97.27	111.56	120.03	129.63	(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=	133.4	117.07	121.76	107.5	104.16	91.35	86.1	96.73	97.27	111.56	120.03	129.63	

Output from water heater (annual)$_{1...12}$ 1316.57 (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=	39.68	34.7	35.81	31.22	29.96	25.85	23.95	27.49	27.82	32.42	35.39	38.43	(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=	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	(66)

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

(67)m=	12.73	11.31	9.2	6.96	5.2	4.39	4.75	6.17	8.28	10.52	12.28	13.09	(67)

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

(68)m=	142.82	144.3	140.57	132.62	122.58	113.15	106.85	105.36	109.1	117.05	127.09	136.52	(68)

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

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

Pumps and fans gains (Table 5a)

(70)m=	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	(70)

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

(71)m=	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	(71)

Water heating gains (Table 5)

(72)m=	53.33	51.64	48.13	43.36	40.26	35.9	32.2	36.95	38.63	43.57	49.15	51.65	(72)

DER WorkSheet: New dwelling design stage

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

(73)m=	263.11	261.48	252.13	237.17	222.28	207.68	198.02	202.71	210.25	225.37	242.74	255.48	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	3.11	x	19.64	x	0.63	x	0.7	=	18.67	(76)
East	0.9x 0.77	x	1.5	x	19.64	x	0.63	x	0.7	=	9	(76)
East	0.9x 0.77	x	3.11	x	38.42	x	0.63	x	0.7	=	36.52	(76)
East	0.9x 0.77	x	1.5	x	38.42	x	0.63	x	0.7	=	17.61	(76)
East	0.9x 0.77	x	3.11	x	63.27	x	0.63	x	0.7	=	60.14	(76)
East	0.9x 0.77	x	1.5	x	63.27	x	0.63	x	0.7	=	29.01	(76)
East	0.9x 0.77	x	3.11	x	92.28	x	0.63	x	0.7	=	87.71	(76)
East	0.9x 0.77	x	1.5	x	92.28	x	0.63	x	0.7	=	42.3	(76)
East	0.9x 0.77	x	3.11	x	113.09	x	0.63	x	0.7	=	107.49	(76)
East	0.9x 0.77	x	1.5	x	113.09	x	0.63	x	0.7	=	51.84	(76)
East	0.9x 0.77	x	3.11	x	115.77	x	0.63	x	0.7	=	110.03	(76)
East	0.9x 0.77	x	1.5	x	115.77	x	0.63	x	0.7	=	53.07	(76)
East	0.9x 0.77	x	3.11	x	110.22	x	0.63	x	0.7	=	104.76	(76)
East	0.9x 0.77	x	1.5	x	110.22	x	0.63	x	0.7	=	50.53	(76)
East	0.9x 0.77	x	3.11	x	94.68	x	0.63	x	0.7	=	89.99	(76)
East	0.9x 0.77	x	1.5	x	94.68	x	0.63	x	0.7	=	43.4	(76)
East	0.9x 0.77	x	3.11	x	73.59	x	0.63	x	0.7	=	69.94	(76)
East	0.9x 0.77	x	1.5	x	73.59	x	0.63	x	0.7	=	33.73	(76)
East	0.9x 0.77	x	3.11	x	45.59	x	0.63	x	0.7	=	43.33	(76)
East	0.9x 0.77	x	1.5	x	45.59	x	0.63	x	0.7	=	20.9	(76)
East	0.9x 0.77	x	3.11	x	24.49	x	0.63	x	0.7	=	23.28	(76)
East	0.9x 0.77	x	1.5	x	24.49	x	0.63	x	0.7	=	11.23	(76)
East	0.9x 0.77	x	3.11	x	16.15	x	0.63	x	0.7	=	15.35	(76)
East	0.9x 0.77	x	1.5	x	16.15	x	0.63	x	0.7	=	7.4	(76)
West	0.9x 0.77	x	6.67	x	19.64	x	0.63	x	0.7	=	40.04	(80)
West	0.9x 0.77	x	3.76	x	19.64	x	0.63	x	0.7	=	22.57	(80)
West	0.9x 0.77	x	6.67	x	38.42	x	0.63	x	0.7	=	78.32	(80)
West	0.9x 0.77	x	3.76	x	38.42	x	0.63	x	0.7	=	44.15	(80)
West	0.9x 0.77	x	6.67	x	63.27	x	0.63	x	0.7	=	128.98	(80)
West	0.9x 0.77	x	3.76	x	63.27	x	0.63	x	0.7	=	72.71	(80)
West	0.9x 0.77	x	6.67	x	92.28	x	0.63	x	0.7	=	188.11	(80)
West	0.9x 0.77	x	3.76	x	92.28	x	0.63	x	0.7	=	106.04	(80)
West	0.9x 0.77	x	6.67	x	113.09	x	0.63	x	0.7	=	230.53	(80)
West	0.9x 0.77	x	3.76	x	113.09	x	0.63	x	0.7	=	129.96	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	6.67	x	115.77	x	0.63	x	0.7	=	235.99	(80)
West	0.9x	0.77	x	3.76	x	115.77	x	0.63	x	0.7	=	133.03	(80)
West	0.9x	0.77	x	6.67	x	110.22	x	0.63	x	0.7	=	224.67	(80)
West	0.9x	0.77	x	3.76	x	110.22	x	0.63	x	0.7	=	126.65	(80)
West	0.9x	0.77	x	6.67	x	94.68	x	0.63	x	0.7	=	192.99	(80)
West	0.9x	0.77	x	3.76	x	94.68	x	0.63	x	0.7	=	108.79	(80)
West	0.9x	0.77	x	6.67	x	73.59	x	0.63	x	0.7	=	150.01	(80)
West	0.9x	0.77	x	3.76	x	73.59	x	0.63	x	0.7	=	84.56	(80)
West	0.9x	0.77	x	6.67	x	45.59	x	0.63	x	0.7	=	92.93	(80)
West	0.9x	0.77	x	3.76	x	45.59	x	0.63	x	0.7	=	52.39	(80)
West	0.9x	0.77	x	6.67	x	24.49	x	0.63	x	0.7	=	49.92	(80)
West	0.9x	0.77	x	3.76	x	24.49	x	0.63	x	0.7	=	28.14	(80)
West	0.9x	0.77	x	6.67	x	16.15	x	0.63	x	0.7	=	32.92	(80)
West	0.9x	0.77	x	3.76	x	16.15	x	0.63	x	0.7	=	18.56	(80)

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

(83)m=	90.27	176.6	290.83	424.16	519.82	532.13	506.61	435.17	338.25	209.55	112.56	74.24	(83)

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

(84)m=	353.39	438.08	542.96	661.33	742.1	739.81	704.63	637.88	548.49	434.92	355.3	329.72	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.93	0.89	0.82	0.7	0.56	0.42	0.32	0.36	0.55	0.78	0.9	0.94	(86)

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

(87)m=	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=	20.42	20.42	20.43	20.43	20.44	20.45	20.45	20.45	20.44	20.44	20.43	20.43	(88)

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

(89)m=	0.92	0.88	0.8	0.68	0.53	0.39	0.28	0.32	0.52	0.76	0.89	0.93	(89)

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

(90)m=	20.42	20.42	20.43	20.43	20.44	20.45	20.45	20.45	20.44	20.44	20.43	20.43	(90)

fLA = Living area ÷ (4) = 0.23 (91)

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

(92)m=	20.55	20.55	20.56	20.56	20.56	20.57	20.57	20.57	20.57	20.56	20.56	20.56	(92)

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

(93)m=	20.55	20.55	20.56	20.56	20.56	20.57	20.57	20.57	20.57	20.56	20.56	20.56	(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=	0.92	0.88	0.81	0.68	0.54	0.39	0.29	0.33	0.53	0.77	0.89	0.93	(94)

DER WorkSheet: New dwelling design stage

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

(95)m=	326.4	386.51	438.1	451.2	399.29	291.92	203.21	209.67	290.96	334.17	316.94	307.6	(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=	908.01	871.81	780.3	637.16	482.71	319.91	212.77	222.82	348.83	542.61	737.8	902.36	(97)

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

(98)m=	432.72	326.12	254.59	133.89	62.07	0	0	0	0	155.08	303.02	442.5	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2109.99 (98)

Space heating requirement in kWh/m²/year 43.69 (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 1 506.29 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	432.72	326.12	254.59	133.89	62.07	0	0	0	0	155.08	303.02	442.5	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	85.47	64.41	50.29	26.45	12.26	0	0	0	0	30.63	59.85	87.4	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 416.75 (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)

	133.4	117.07	121.76	107.5	104.16	91.35	86.1	96.73	97.27	111.56	120.03	129.63	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

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

(219)m=	68.7	60.29	62.71	55.36	53.64	47.05	44.34	49.82	50.09	57.45	61.81	66.76	

Total = Sum(219a)$_{1...12}$ = 678.01 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		416.75
Water heating fuel used		678.01
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	122.97	(230a)

DER WorkSheet: New dwelling design stage

warm air heating system fans		66.28	(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	189.25	(231)
Electricity for lighting		224.86	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1508.87	(338)

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

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	216.3	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	351.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =				568.18	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	98.22	(267)
Electricity for lighting	(232) x		0.519	=	116.7	(268)
Total CO2, kg/year		sum of (265)…(271) =			783.11	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			16.21	(273)
EI rating (section 14)					89	(274)

Predicted Energy Assessment

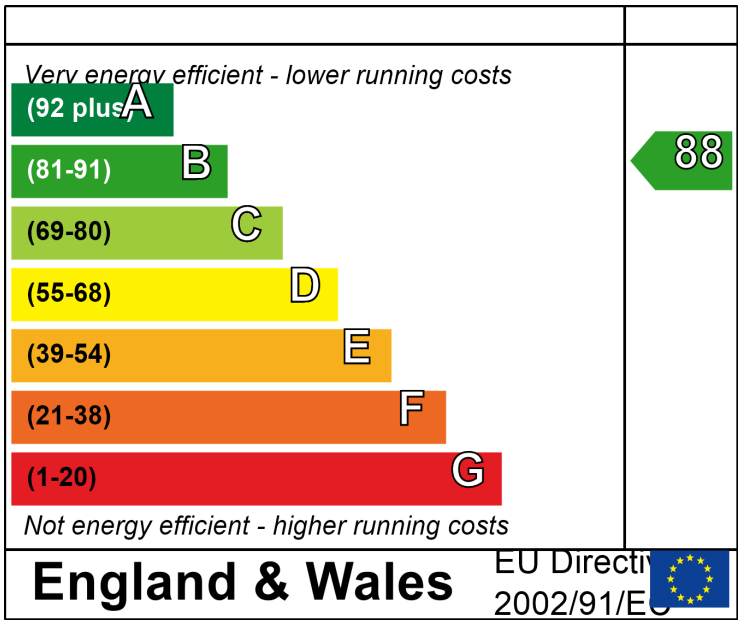
FLAT 04
43 London Street
Reading
RG1 4PS

Dwelling type: Top floor Maisonette
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 48.3 m²

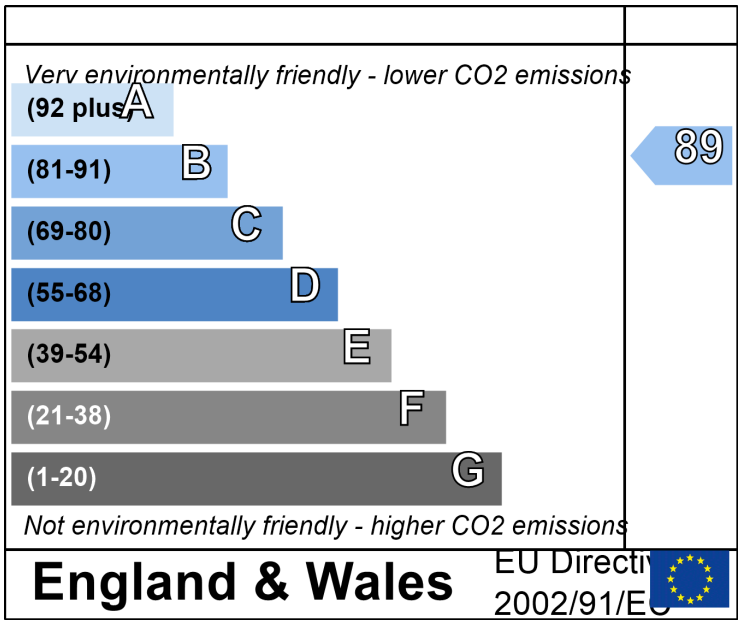
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 04

Address : FLAT 04, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	36.4 (1a)	x	2.25 (2a)	=	81.9	(3a)
First floor	11.9 (1b)	x	2.4 (2b)	=	28.56	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	48.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		110.46	(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			5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.25 (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) =		0.19 (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

SAP WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

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

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

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

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) = 72.25 (23c)

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

(24a)m=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37

(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=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.13	=	0.273			(26)
Windows Type 1			6.67	x1/[1/(1.1)+ 0.04]		=	7.03			(27)
Windows Type 2			3.11	x1/[1/(1.1)+ 0.04]		=	3.28			(27)
Windows Type 3			3.76	x1/[1/(1.1)+ 0.04]		=	3.96			(27)
Windows Type 4			1.5	x1/[1/(1.1)+ 0.04]		=	1.58			(27)
Walls Type1	64.84	15.04	49.8	x	0.12	=	5.98	14	697.2	(29)
Walls Type2	5.98	2.1	3.88	x	0.11	=	0.43	14	54.32	(29)
Roof Type1	21.4	0	21.4	x	0.11	=	2.35	9	192.6	(30)
Roof Type2	11.9	0	11.9	x	0.11	=	1.31	9	107.1	(30)
Total area of elements, m²			104.12							(31)
Party wall			35.65	x	0	=	0	20	713	(32)
Party floor			36.4					30	1092	(32a)
Internal wall **			67.16					9	604.4401	(32c)
Internal floor			11.9					18	214.2	(32d)
Internal ceiling			11.9					9	107.1	(32e)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 26.19 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3781.96 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 78.3 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 15.62 (36)

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

Total fabric heat loss (33) + (36) = 41.8 (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=	14.06	13.89	13.71	12.83	12.65	11.77	11.77	11.59	12.12	12.65	13	13.36	(38)

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

(39)m=	55.87	55.69	55.51	54.63	54.45	53.57	53.57	53.39	53.92	54.45	54.81	55.16	

Average = Sum(39)$_{1...12}$ /12= 54.59 (39)

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

(40)m=	1.16	1.15	1.15	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.13	1.14	

Average = Sum(40)$_{1...12}$ /12= 1.13 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.64 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 73.15 (43)

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

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

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

(44)m=	80.47	77.54	74.62	71.69	68.77	65.84	65.84	68.77	71.69	74.62	77.54	80.47	

Total = Sum(44)$_{1...12}$ = 877.85 (44)

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

(45)m=	119.33	104.37	107.7	93.9	90.1	77.75	72.04	82.67	83.66	97.5	106.42	115.57	

Total = Sum(45)$_{1...12}$ = 1151 (45)

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

(46)m=	17.9	15.66	16.16	14.08	13.51	11.66	10.81	12.4	12.55	14.62	15.96	17.34	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

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

SAP WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	133.4	117.07	121.76	107.5	104.16	91.35	86.1	96.73	97.27	111.56	120.03	129.63	(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=	133.4	117.07	121.76	107.5	104.16	91.35	86.1	96.73	97.27	111.56	120.03	129.63	

Output from water heater (annual)$_{1...12}$ 1316.57 (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=	39.68	34.7	35.81	31.22	29.96	25.85	23.95	27.49	27.82	32.42	35.39	38.43	(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=	98.41	98.41	98.41	98.41	98.41	98.41	98.41	98.41	98.41	98.41	98.41	98.41	(66)

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

(67)m=	31.83	28.27	22.99	17.41	13.01	10.99	11.87	15.43	20.71	26.29	30.69	32.72	(67)

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

(68)m=	213.16	215.38	209.8	197.94	182.96	168.88	159.47	157.26	162.83	174.7	189.68	203.76	(68)

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

(69)m=	46.48	46.48	46.48	46.48	46.48	46.48	46.48	46.48	46.48	46.48	46.48	46.48	(69)

Pumps and fans gains (Table 5a)

(70)m=	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	6.63	(70)

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

(71)m=	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	(71)

Water heating gains (Table 5)

(72)m=	53.33	51.64	48.13	43.36	40.26	35.9	32.2	36.95	38.63	43.57	49.15	51.65	(72)

SAP WorkSheet: New dwelling design stage

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

(73)m=	384.24	381.2	366.84	344.62	322.14	301.68	289.45	295.55	308.09	330.48	355.43	374.04

(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)	
East	0.9x	1	x 3.11	x	19.64	x	0.63	x	0.7	=	24.24	(76)
East	0.9x	1	x 1.5	x	19.64	x	0.63	x	0.7	=	11.69	(76)
East	0.9x	1	x 3.11	x	38.42	x	0.63	x	0.7	=	47.42	(76)
East	0.9x	1	x 1.5	x	38.42	x	0.63	x	0.7	=	22.87	(76)
East	0.9x	1	x 3.11	x	63.27	x	0.63	x	0.7	=	78.1	(76)
East	0.9x	1	x 1.5	x	63.27	x	0.63	x	0.7	=	37.67	(76)
East	0.9x	1	x 3.11	x	92.28	x	0.63	x	0.7	=	113.91	(76)
East	0.9x	1	x 1.5	x	92.28	x	0.63	x	0.7	=	54.94	(76)
East	0.9x	1	x 3.11	x	113.09	x	0.63	x	0.7	=	139.6	(76)
East	0.9x	1	x 1.5	x	113.09	x	0.63	x	0.7	=	67.33	(76)
East	0.9x	1	x 3.11	x	115.77	x	0.63	x	0.7	=	142.9	(76)
East	0.9x	1	x 1.5	x	115.77	x	0.63	x	0.7	=	68.92	(76)
East	0.9x	1	x 3.11	x	110.22	x	0.63	x	0.7	=	136.05	(76)
East	0.9x	1	x 1.5	x	110.22	x	0.63	x	0.7	=	65.62	(76)
East	0.9x	1	x 3.11	x	94.68	x	0.63	x	0.7	=	116.86	(76)
East	0.9x	1	x 1.5	x	94.68	x	0.63	x	0.7	=	56.37	(76)
East	0.9x	1	x 3.11	x	73.59	x	0.63	x	0.7	=	90.84	(76)
East	0.9x	1	x 1.5	x	73.59	x	0.63	x	0.7	=	43.81	(76)
East	0.9x	1	x 3.11	x	45.59	x	0.63	x	0.7	=	56.27	(76)
East	0.9x	1	x 1.5	x	45.59	x	0.63	x	0.7	=	27.14	(76)
East	0.9x	1	x 3.11	x	24.49	x	0.63	x	0.7	=	30.23	(76)
East	0.9x	1	x 1.5	x	24.49	x	0.63	x	0.7	=	14.58	(76)
East	0.9x	1	x 3.11	x	16.15	x	0.63	x	0.7	=	19.94	(76)
East	0.9x	1	x 1.5	x	16.15	x	0.63	x	0.7	=	9.62	(76)
West	0.9x	1	x 6.67	x	19.64	x	0.63	x	0.7	=	51.99	(80)
West	0.9x	1	x 3.76	x	19.64	x	0.63	x	0.7	=	29.31	(80)
West	0.9x	1	x 6.67	x	38.42	x	0.63	x	0.7	=	101.71	(80)
West	0.9x	1	x 3.76	x	38.42	x	0.63	x	0.7	=	57.34	(80)
West	0.9x	1	x 6.67	x	63.27	x	0.63	x	0.7	=	167.5	(80)
West	0.9x	1	x 3.76	x	63.27	x	0.63	x	0.7	=	94.43	(80)
West	0.9x	1	x 6.67	x	92.28	x	0.63	x	0.7	=	244.3	(80)
West	0.9x	1	x 3.76	x	92.28	x	0.63	x	0.7	=	137.71	(80)
West	0.9x	1	x 6.67	x	113.09	x	0.63	x	0.7	=	299.39	(80)
West	0.9x	1	x 3.76	x	113.09	x	0.63	x	0.7	=	168.77	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	1	x	6.67	x	115.77	x	0.63	x	0.7	=	306.48	(80)
West	0.9x	1	x	3.76	x	115.77	x	0.63	x	0.7	=	172.77	(80)
West	0.9x	1	x	6.67	x	110.22	x	0.63	x	0.7	=	291.78	(80)
West	0.9x	1	x	3.76	x	110.22	x	0.63	x	0.7	=	164.48	(80)
West	0.9x	1	x	6.67	x	94.68	x	0.63	x	0.7	=	250.64	(80)
West	0.9x	1	x	3.76	x	94.68	x	0.63	x	0.7	=	141.29	(80)
West	0.9x	1	x	6.67	x	73.59	x	0.63	x	0.7	=	194.81	(80)
West	0.9x	1	x	3.76	x	73.59	x	0.63	x	0.7	=	109.82	(80)
West	0.9x	1	x	6.67	x	45.59	x	0.63	x	0.7	=	120.69	(80)
West	0.9x	1	x	3.76	x	45.59	x	0.63	x	0.7	=	68.03	(80)
West	0.9x	1	x	6.67	x	24.49	x	0.63	x	0.7	=	64.83	(80)
West	0.9x	1	x	3.76	x	24.49	x	0.63	x	0.7	=	36.55	(80)
West	0.9x	1	x	6.67	x	16.15	x	0.63	x	0.7	=	42.76	(80)
West	0.9x	1	x	3.76	x	16.15	x	0.63	x	0.7	=	24.1	(80)

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

(83)m=	117.24	229.35	377.7	550.85	675.09	691.08	657.93	565.16	439.28	272.14	146.18	96.41	(83)

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

(84)m=	501.48	610.55	744.54	895.47	997.24	992.76	947.39	860.7	747.37	602.62	501.61	470.45	(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=	0.87	0.81	0.72	0.58	0.45	0.33	0.24	0.27	0.44	0.67	0.82	0.88	(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=	20.42	20.42	20.43	20.43	20.44	20.45	20.45	20.45	20.44	20.44	20.43	20.43	(88)

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

(89)m=	0.86	0.8	0.71	0.57	0.43	0.3	0.21	0.24	0.41	0.65	0.81	0.87	(89)

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

(90)m=	20.42	20.42	20.43	20.43	20.44	20.45	20.45	20.45	20.44	20.44	20.43	20.43	(90)

fLA = Living area ÷ (4) = 0.23 (91)

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

(92)m=	20.55	20.55	20.56	20.56	20.56	20.57	20.57	20.57	20.57	20.56	20.56	20.56	(92)

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

(93)m=	20.55	20.55	20.56	20.56	20.56	20.57	20.57	20.57	20.57	20.56	20.56	20.56	(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=	0.86	0.8	0.71	0.57	0.43	0.31	0.22	0.25	0.42	0.66	0.81	0.88	(94)

SAP WorkSheet: New dwelling design stage

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

(95)m=	432.59	491.32	528.25	511.5	430.49	303.63	207.47	215.47	313.71	396.8	408.71	412.18	(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=	908.01	871.81	780.3	637.16	482.71	319.91	212.77	222.82	348.83	542.61	737.8	902.36	(97)

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

(98)m=	353.71	255.69	187.52	90.48	38.86	0	0	0	0	108.48	236.95	364.7	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1636.39 (98)

Space heating requirement in kWh/m²/year 33.88 (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 1 506.29 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	353.71	255.69	187.52	90.48	38.86	0	0	0	0	108.48	236.95	364.7	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	69.86	50.5	37.04	17.87	7.67	0	0	0	0	21.43	46.8	72.03	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 323.21 (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

Output from water heater (calculated above)

	133.4	117.07	121.76	107.5	104.16	91.35	86.1	96.73	97.27	111.56	120.03	129.63	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

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

(219)m=	68.7	60.29	62.71	55.36	53.64	47.05	44.34	49.82	50.09	57.45	61.81	66.76	

Total = Sum(219a)$_{1...12}$ = 678.01 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		323.21
Water heating fuel used		678.01
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	122.97	(230a)

SAP WorkSheet: New dwelling design stage

warm air heating system fans		66.28	(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	189.25	(231)
Electricity for lighting		224.86	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1415.33	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211)	x	13.19	x 0.01 =	42.63	(240)
Space heating - main system 2	(213)	x	0	x 0.01 =	0	(241)
Space heating - secondary	(215)	x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	89.43	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	24.96	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	29.66	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				186.68	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.84	(257)
SAP rating (Section 12)	88.28	(258)

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

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.519	=	167.75	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	351.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =				519.64	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	98.22	(267)
Electricity for lighting	(232)	x	0.519	=	116.7	(268)
Total CO2, kg/year	sum of (265)…(271) =				734.56	(272)
CO2 emissions per m²	(272) ÷ (4) =				15.21	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	992.26	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2081.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3073.76	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	580.98	(267)
Electricity for lighting	(232) x	0	=	690.32	(268)
‘Total Primary Energy	sum of (265)…(271) =			4345.06	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			89.96	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 04

Address : FLAT 04, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	36.4 (1a)	x	2.25 (2a)	=	81.9	(3a)
First floor	11.9 (1b)	x	2.4 (2b)	=	28.56	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	48.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		110.46	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.18 (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)		0.43 (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) =		0.33 (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

TER WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

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

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

0.43	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			2.1	x	1	=	2.1			(26)
Windows Type 1			4.42	x1/[1/(1.4)+ 0.04]		=	5.86			(27)
Windows Type 2			2.06	x1/[1/(1.4)+ 0.04]		=	2.73			(27)
Windows Type 3			2.49	x1/[1/(1.4)+ 0.04]		=	3.3			(27)
Windows Type 4			0.99	x1/[1/(1.4)+ 0.04]		=	1.31			(27)
Walls Type1	64.84	9.96	54.88	x	0.18	=	9.88			(29)
Walls Type2	5.98	2.1	3.88	x	0.18	=	0.7			(29)
Roof Type1	21.4	0	21.4	x	0.13	=	2.78			(30)
Roof Type2	11.9	0	11.9	x	0.13	=	1.55			(30)
Total area of elements, m²			104.12							(31)
Party wall			35.65	x	0	=	0			(32)
Party floor			36.4							(32a)
Internal wall **			67.16							(32c)
Internal floor			11.9							(32d)
Internal ceiling			11.9							(32e)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 30.21 (33)

TER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3853.08 (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 5.21 (36)

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

Total fabric heat loss (33) + (36) = 35.42 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	21.53	21.4	21.28	20.69	20.58	20.06	20.06	19.97	20.26	20.58	20.8	21.03	(38)

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

(39)m=	56.95	56.82	56.69	56.1	55.99	55.48	55.48	55.38	55.68	55.99	56.22	56.45	

Average = Sum(39)$_{1...12}$ /12= 56.1 (39)

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

(40)m=	1.18	1.18	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.16	1.17	

Average = Sum(40)$_{1...12}$ /12= 1.16 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.64 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 73.15 (43)

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

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

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

(44)m=	80.47	77.54	74.62	71.69	68.77	65.84	65.84	68.77	71.69	74.62	77.54	80.47	

Total = Sum(44)$_{1...12}$ = 877.85 (44)

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

(45)m=	119.33	104.37	107.7	93.9	90.1	77.75	72.04	82.67	83.66	97.5	106.42	115.57	

Total = Sum(45)$_{1...12}$ = 1151 (45)

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

(46)m=	17.9	15.66	16.16	14.08	13.51	11.66	10.81	12.4	12.55	14.62	15.96	17.34	(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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (50)

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

TER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

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

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	168.58	148.85	156.94	141.55	139.34	125.4	121.29	131.91	131.31	146.74	154.08	164.81	(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=	168.58	148.85	156.94	141.55	139.34	125.4	121.29	131.91	131.31	146.74	154.08	164.81	

Output from water heater (annual)$_{1...12}$: 1730.8 (64)

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

(65)m=	79.07	70.29	75.2	69.34	69.35	63.97	63.35	66.88	65.94	71.81	73.51	77.82	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	82.01	(66)

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

(67)m=	12.79	11.36	9.24	6.99	5.23	4.41	4.77	6.2	8.32	10.56	12.33	13.14	(67)

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

(68)m=	142.82	144.3	140.57	132.62	122.58	113.15	106.85	105.36	109.1	117.05	127.09	136.52	(68)

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

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

Pumps and fans gains (Table 5a)

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

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

(71)m=	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	-65.61	(71)

Water heating gains (Table 5)

(72)m=	106.28	104.59	101.08	96.31	93.21	88.85	85.15	89.9	91.58	96.52	102.1	104.6	(72)

TER WorkSheet: New dwelling design stage

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

(73)m=	312.49	310.85	301.49	286.52	271.62	257.02	247.36	252.06	259.6	274.73	292.11	304.86	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	2.06	x	19.64	x	0.63	x	0.7	=	12.36	(76)
East	0.9x 0.77	x	0.99	x	19.64	x	0.63	x	0.7	=	5.94	(76)
East	0.9x 0.77	x	2.06	x	38.42	x	0.63	x	0.7	=	24.19	(76)
East	0.9x 0.77	x	0.99	x	38.42	x	0.63	x	0.7	=	11.62	(76)
East	0.9x 0.77	x	2.06	x	63.27	x	0.63	x	0.7	=	39.83	(76)
East	0.9x 0.77	x	0.99	x	63.27	x	0.63	x	0.7	=	19.14	(76)
East	0.9x 0.77	x	2.06	x	92.28	x	0.63	x	0.7	=	58.1	(76)
East	0.9x 0.77	x	0.99	x	92.28	x	0.63	x	0.7	=	27.92	(76)
East	0.9x 0.77	x	2.06	x	113.09	x	0.63	x	0.7	=	71.2	(76)
East	0.9x 0.77	x	0.99	x	113.09	x	0.63	x	0.7	=	34.22	(76)
East	0.9x 0.77	x	2.06	x	115.77	x	0.63	x	0.7	=	72.88	(76)
East	0.9x 0.77	x	0.99	x	115.77	x	0.63	x	0.7	=	35.03	(76)
East	0.9x 0.77	x	2.06	x	110.22	x	0.63	x	0.7	=	69.39	(76)
East	0.9x 0.77	x	0.99	x	110.22	x	0.63	x	0.7	=	33.35	(76)
East	0.9x 0.77	x	2.06	x	94.68	x	0.63	x	0.7	=	59.6	(76)
East	0.9x 0.77	x	0.99	x	94.68	x	0.63	x	0.7	=	28.64	(76)
East	0.9x 0.77	x	2.06	x	73.59	x	0.63	x	0.7	=	46.33	(76)
East	0.9x 0.77	x	0.99	x	73.59	x	0.63	x	0.7	=	22.26	(76)
East	0.9x 0.77	x	2.06	x	45.59	x	0.63	x	0.7	=	28.7	(76)
East	0.9x 0.77	x	0.99	x	45.59	x	0.63	x	0.7	=	13.79	(76)
East	0.9x 0.77	x	2.06	x	24.49	x	0.63	x	0.7	=	15.42	(76)
East	0.9x 0.77	x	0.99	x	24.49	x	0.63	x	0.7	=	7.41	(76)
East	0.9x 0.77	x	2.06	x	16.15	x	0.63	x	0.7	=	10.17	(76)
East	0.9x 0.77	x	0.99	x	16.15	x	0.63	x	0.7	=	4.89	(76)
West	0.9x 0.77	x	4.42	x	19.64	x	0.63	x	0.7	=	26.53	(80)
West	0.9x 0.77	x	2.49	x	19.64	x	0.63	x	0.7	=	14.95	(80)
West	0.9x 0.77	x	4.42	x	38.42	x	0.63	x	0.7	=	51.9	(80)
West	0.9x 0.77	x	2.49	x	38.42	x	0.63	x	0.7	=	29.24	(80)
West	0.9x 0.77	x	4.42	x	63.27	x	0.63	x	0.7	=	85.47	(80)
West	0.9x 0.77	x	2.49	x	63.27	x	0.63	x	0.7	=	48.15	(80)
West	0.9x 0.77	x	4.42	x	92.28	x	0.63	x	0.7	=	124.65	(80)
West	0.9x 0.77	x	2.49	x	92.28	x	0.63	x	0.7	=	70.22	(80)
West	0.9x 0.77	x	4.42	x	113.09	x	0.63	x	0.7	=	152.77	(80)
West	0.9x 0.77	x	2.49	x	113.09	x	0.63	x	0.7	=	86.06	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	4.42	x	115.77	x	0.63	x	0.7	=	156.38	(80)
West	0.9x	0.77	x	2.49	x	115.77	x	0.63	x	0.7	=	88.1	(80)
West	0.9x	0.77	x	4.42	x	110.22	x	0.63	x	0.7	=	148.88	(80)
West	0.9x	0.77	x	2.49	x	110.22	x	0.63	x	0.7	=	83.87	(80)
West	0.9x	0.77	x	4.42	x	94.68	x	0.63	x	0.7	=	127.89	(80)
West	0.9x	0.77	x	2.49	x	94.68	x	0.63	x	0.7	=	72.05	(80)
West	0.9x	0.77	x	4.42	x	73.59	x	0.63	x	0.7	=	99.41	(80)
West	0.9x	0.77	x	2.49	x	73.59	x	0.63	x	0.7	=	56	(80)
West	0.9x	0.77	x	4.42	x	45.59	x	0.63	x	0.7	=	61.58	(80)
West	0.9x	0.77	x	2.49	x	45.59	x	0.63	x	0.7	=	34.69	(80)
West	0.9x	0.77	x	4.42	x	24.49	x	0.63	x	0.7	=	33.08	(80)
West	0.9x	0.77	x	2.49	x	24.49	x	0.63	x	0.7	=	18.64	(80)
West	0.9x	0.77	x	4.42	x	16.15	x	0.63	x	0.7	=	21.82	(80)
West	0.9x	0.77	x	2.49	x	16.15	x	0.63	x	0.7	=	12.29	(80)

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

(83)m=	59.78	116.95	192.6	280.89	344.24	352.39	335.49	288.18	224	138.77	74.54	49.16	(83)

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

(84)m=	372.27	427.8	494.08	567.41	615.87	609.41	582.86	540.24	483.6	413.5	366.65	354.02	(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	0.97	0.9	0.76	0.57	0.42	0.47	0.73	0.94	0.99	1	(86)

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

(87)m=	19.88	20.05	20.33	20.67	20.89	20.98	21	20.99	20.94	20.62	20.19	19.85	(87)

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

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

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

(89)m=	0.99	0.98	0.96	0.87	0.7	0.48	0.32	0.36	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=	18.46	18.71	19.12	19.59	19.86	19.95	19.96	19.96	19.91	19.54	18.92	18.42	(90)

fLA = Living area ÷ (4) = 0.23 (91)

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

(92)m=	18.78	19.01	19.4	19.83	20.09	20.18	20.2	20.2	20.14	19.79	19.21	18.75	(92)

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

(93)m=	18.78	19.01	19.4	19.83	20.09	20.18	20.2	20.2	20.14	19.79	19.21	18.75	(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	0.7	0.5	0.34	0.39	0.66	0.91	0.98	0.99	(94)

TER WorkSheet: New dwelling design stage

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

(95)m=	368.18	418.6	468.51	490.06	434	304.65	198.91	209.12	317.84	376.14	358.68	350.9	(95)

Monthly average external temperature from Table 8

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

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	824.78	801.96	731.08	613.47	469.98	309.8	199.51	210.23	336.56	514.36	680.73	821.09	(97)

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

(98)m=	339.71	257.62	195.35	88.85	26.77	0	0	0	0	102.84	231.88	349.82	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1592.83 (98)

Space heating requirement in kWh/m²/year 32.98 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.5 (206)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	339.71	257.62	195.35	88.85	26.77	0	0	0	0	102.84	231.88	349.82	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	363.33	275.53	208.93	95.03	28.63	0	0	0	0	109.98	248	374.14	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1703.56 (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)

	168.58	148.85	156.94	141.55	139.34	125.4	121.29	131.91	131.31	146.74	154.08	164.81	

Efficiency of water heater 79.8 (216)

(217)m=	86.65	86.26	85.4	83.61	81.35	79.8	79.8	79.8	79.8	83.89	85.9	86.77	(217)

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

(219)m=	194.56	172.55	183.78	169.29	171.28	157.14	151.99	165.3	164.55	174.92	179.36	189.93	

Total = Sum(219a)$_{1...12}$ = 2074.67 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1703.56
Water heating fuel used		2074.67
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)

TER WorkSheet: New dwelling design stage

boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	75	(231)
Electricity for lighting		225.79	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4079.02	(338)

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

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	367.97	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	448.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =				816.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	117.19	(268)
Total CO2, kg/year		sum of (265)…(271) =			972.21	(272)

TER = 29.42 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:21

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 60.2m²

Site Reference : 43LS **Plot Reference:** FLAT 05

Address : FLAT 05, 43 London Street, Reading, RG1 4PS

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)	27.47 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.09 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.19 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.11 (max. 0.25)	0.12 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.06 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

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

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.76	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	1.51m²
Windows facing: South	1.1m²
Windows facing: North	5.74m²
Windows facing: North West	2.1m²
Windows facing: North East	2.1m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.85 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.11 W/m²K
Floors U-value	0.12 W/m²K
Floors U-value	0.12 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 05

Address : FLAT 05, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.2 (1a)	x	2.3 (2a)	=	138.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	138.46	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

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

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			1.51	x1/[1/(1.1)+ 0.04]		=	1.59			(27)
Windows Type 2			1.1	x1/[1/(1.1)+ 0.04]		=	1.16			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Floor Type 1			56.8	x	0.11	=	6.248	75	4260	(28)
Floor Type 2			2.3	x	0.12	=	0.276	75	172.5	(28)
Floor Type 3			1.1	x	0.12	=	0.132	110	121	(28)
Walls Type1	11.04	2.1	8.94	x	0.19	=	1.7	14	125.16	(29)
Walls Type2	44.16	12.55	31.61	x	0.16	=	5.06	14	442.54	(29)
Total area of elements, m²			115.4							(31)
Party wall			21.85	x	0	=	0	20	437	(32)
Party ceiling			60.2					20	1204	(32b)
Internal wall **			124.2					9	1117.8	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.42 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7880 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 130.9 (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 — 17.31 (36)

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

Total fabric heat loss (33) + (36) = 45.73 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	16.34	16.14	15.94	14.94	14.74	13.74	13.74	13.54	14.14	14.74	15.14	15.54	(38)

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

(39)m=	62.07	61.87	61.67	60.67	60.47	59.47	59.47	59.27	59.87	60.47	60.87	61.27	

Average = Sum(39)$_{1...12}$ /12= 60.62 (39)

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

(40)m=	1.03	1.03	1.02	1.01	1	0.99	0.99	0.98	0.99	1	1.01	1.02	

Average = Sum(40)$_{1...12}$ /12= 1.01 (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 — 1.99 (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 — 81.4 (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=	89.54	86.28	83.03	79.77	76.51	73.26	73.26	76.51	79.77	83.03	86.28	89.54	

Total = Sum(44)$_{1...12}$ = 976.78 (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=	132.78	116.13	119.84	104.48	100.25	86.51	80.16	91.99	93.08	108.48	118.42	128.59	

Total = Sum(45)$_{1...12}$ = 1280.71 (45)

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

(46)m=	19.92	17.42	17.98	15.67	15.04	12.98	12.02	13.8	13.96	16.27	17.76	19.29	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)	0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	(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=	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	

Output from water heater (annual)$_{1...12}$ 1446.27 (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=	44.15	38.61	39.85	34.74	33.33	28.76	26.65	30.59	30.95	36.07	39.37	42.76	(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=	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	(66)

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

(67)m=	15.51	13.78	11.21	8.48	6.34	5.35	5.79	7.52	10.09	12.82	14.96	15.95	(67)

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

(68)m=	173.45	175.25	170.72	161.06	148.87	137.41	129.76	127.96	132.5	142.15	154.34	165.8	(68)

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

(69)m=	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	(70)

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

(71)m=	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	(71)

Water heating gains (Table 5)

(72)m=	59.34	57.46	53.56	48.25	44.8	39.95	35.82	41.11	42.99	48.48	54.69	57.47	(72)

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

(73)m=	309.42	307.61	296.59	278.91	261.13	243.84	232.49	237.71	246.69	264.57	285.1	300.33	(73)

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.87	x	10.63	x	0.63	x	0.7	=	18.65	(74)
North	0.9x	0.77	x	2.87	x	20.32	x	0.63	x	0.7	=	35.65	(74)
North	0.9x	0.77	x	2.87	x	34.53	x	0.63	x	0.7	=	60.57	(74)
North	0.9x	0.77	x	2.87	x	55.46	x	0.63	x	0.7	=	97.3	(74)
North	0.9x	0.77	x	2.87	x	74.72	x	0.63	x	0.7	=	131.07	(74)
North	0.9x	0.77	x	2.87	x	79.99	x	0.63	x	0.7	=	140.31	(74)
North	0.9x	0.77	x	2.87	x	74.68	x	0.63	x	0.7	=	131	(74)
North	0.9x	0.77	x	2.87	x	59.25	x	0.63	x	0.7	=	103.93	(74)
North	0.9x	0.77	x	2.87	x	41.52	x	0.63	x	0.7	=	72.83	(74)
North	0.9x	0.77	x	2.87	x	24.19	x	0.63	x	0.7	=	42.43	(74)
North	0.9x	0.77	x	2.87	x	13.12	x	0.63	x	0.7	=	23.01	(74)
North	0.9x	0.77	x	2.87	x	8.86	x	0.63	x	0.7	=	15.55	(74)
Northeast	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(75)
Northeast	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(75)
Northeast	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(75)
Northeast	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(75)
Northeast	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(75)
Northeast	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(75)
Northeast	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(75)
Northeast	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(75)
Northeast	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(75)
Northeast	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(75)
Northeast	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(75)
Northeast	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(75)
South	0.9x	0.77	x	1.1	x	46.75	x	0.63	x	0.7	=	15.72	(78)
South	0.9x	0.77	x	1.1	x	76.57	x	0.63	x	0.7	=	25.74	(78)
South	0.9x	0.77	x	1.1	x	97.53	x	0.63	x	0.7	=	32.79	(78)
South	0.9x	0.77	x	1.1	x	110.23	x	0.63	x	0.7	=	37.06	(78)
South	0.9x	0.77	x	1.1	x	114.87	x	0.63	x	0.7	=	38.62	(78)
South	0.9x	0.77	x	1.1	x	110.55	x	0.63	x	0.7	=	37.16	(78)
South	0.9x	0.77	x	1.1	x	108.01	x	0.63	x	0.7	=	36.31	(78)
South	0.9x	0.77	x	1.1	x	104.89	x	0.63	x	0.7	=	35.26	(78)
South	0.9x	0.77	x	1.1	x	101.89	x	0.63	x	0.7	=	34.25	(78)
South	0.9x	0.77	x	1.1	x	82.59	x	0.63	x	0.7	=	27.76	(78)
South	0.9x	0.77	x	1.1	x	55.42	x	0.63	x	0.7	=	18.63	(78)
South	0.9x	0.77	x	1.1	x	40.4	x	0.63	x	0.7	=	13.58	(78)
West	0.9x	0.77	x	1.51	x	19.64	x	0.63	x	0.7	=	9.06	(80)
West	0.9x	0.77	x	1.51	x	38.42	x	0.63	x	0.7	=	17.73	(80)
West	0.9x	0.77	x	1.51	x	63.27	x	0.63	x	0.7	=	29.2	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.51	x	92.28	x	0.63	x	0.7	=	42.59	(80)
West	0.9x	0.77	x	1.51	x	113.09	x	0.63	x	0.7	=	52.19	(80)
West	0.9x	0.77	x	1.51	x	115.77	x	0.63	x	0.7	=	53.43	(80)
West	0.9x	0.77	x	1.51	x	110.22	x	0.63	x	0.7	=	50.86	(80)
West	0.9x	0.77	x	1.51	x	94.68	x	0.63	x	0.7	=	43.69	(80)
West	0.9x	0.77	x	1.51	x	73.59	x	0.63	x	0.7	=	33.96	(80)
West	0.9x	0.77	x	1.51	x	45.59	x	0.63	x	0.7	=	21.04	(80)
West	0.9x	0.77	x	1.51	x	24.49	x	0.63	x	0.7	=	11.3	(80)
West	0.9x	0.77	x	1.51	x	16.15	x	0.63	x	0.7	=	7.45	(80)
Northwest	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(81)
Northwest	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(81)
Northwest	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(81)
Northwest	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(81)
Northwest	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(81)
Northwest	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(81)
Northwest	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(81)
Northwest	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(81)
Northwest	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(81)
Northwest	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(81)
Northwest	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(81)
Northwest	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(81)

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

(83)m=	57.92	108.6	175.67	264.17	339.12	355.9	335.11	276.11	205.76	127.26	71.16	48.41	(83)

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

(84)m=	367.34	416.21	472.27	543.07	600.25	599.74	567.6	513.81	452.45	391.83	356.27	348.74	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.97	0.94	0.87	0.75	0.58	0.44	0.5	0.74	0.91	0.97	0.98	(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=	20.48	20.49	20.49	20.5	20.5	20.51	20.51	20.51	20.5	20.5	20.49	20.49	(88)

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

(89)m=	0.98	0.97	0.94	0.86	0.72	0.54	0.4	0.45	0.71	0.9	0.97	0.98	(89)

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

(90)m=	20.48	20.49	20.49	20.5	20.5	20.51	20.51	20.51	20.5	20.5	20.49	20.49	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

DER WorkSheet: New dwelling design stage

(92)m=	20.7	20.7	20.7	20.71	20.71	20.72	20.72	20.72	20.71	20.71	20.71	20.71	(92)

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

(93)m=	20.7	20.7	20.7	20.71	20.71	20.72	20.72	20.72	20.71	20.71	20.71	20.71	(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=	0.98	0.97	0.94	0.87	0.73	0.56	0.42	0.47	0.72	0.91	0.97	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	359.54	402.3	443.11	470.51	440.96	335.18	236.94	243.81	325.98	355.98	344.42	342.44	(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=	1018.14	977.8	876.02	716.5	544.88	363.69	244.74	255.83	395.96	611.4	828.37	1011.38	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	490	386.74	322.09	177.11	77.32	0	0	0	0	190.03	348.44	497.69	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2489.43 (98)

Space heating requirement in kWh/m²/year 41.35 (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 1 509.58 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	490	386.74	322.09	177.11	77.32	0	0	0	0	190.03	348.44	497.69	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	96.16	75.89	63.21	34.76	15.17	0	0	0	0	37.29	68.38	97.67	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 488.52 (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)

	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

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

(219)m=	75.62	66.35	68.96	60.81	58.87	51.56	48.52	54.61	54.95	63.11	67.99	73.46	

Total = Sum(219a)$_{1...12}$ = 744.81 (219)

DER WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		488.52	
Water heating fuel used		744.81	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	160.48		(230a)
warm air heating system fans	83.08		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		243.55	(231)
Electricity for lighting		273.98	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1750.86	(338)

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

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	253.54	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	386.56	(264)
Space and water heating	(261) + (262) + (263) + (264) =			640.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	126.4	(267)
Electricity for lighting	(232) x	0.519	=	142.2	(268)
Total CO2, kg/year	sum of (265)…(271) =			908.7	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			15.09	(273)
EI rating (section 14)				88	(274)

Predicted Energy Assessment

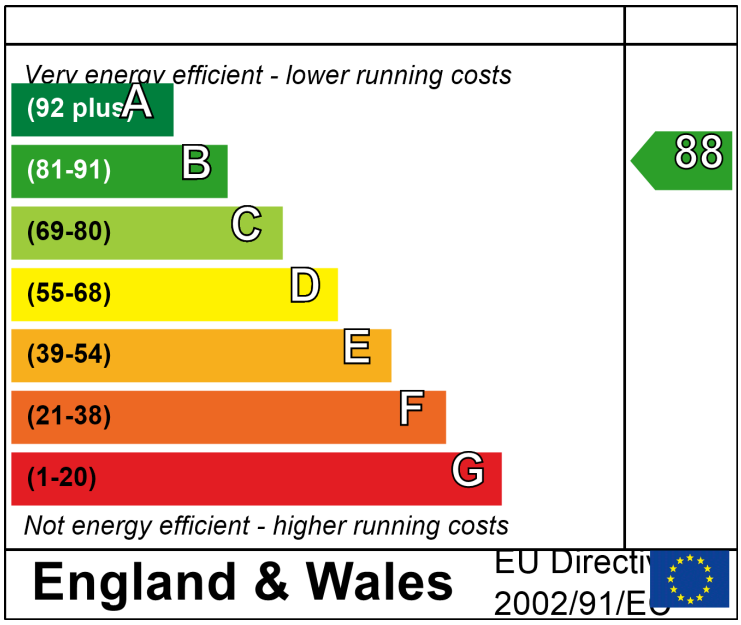
FLAT 05
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 60.2 m²

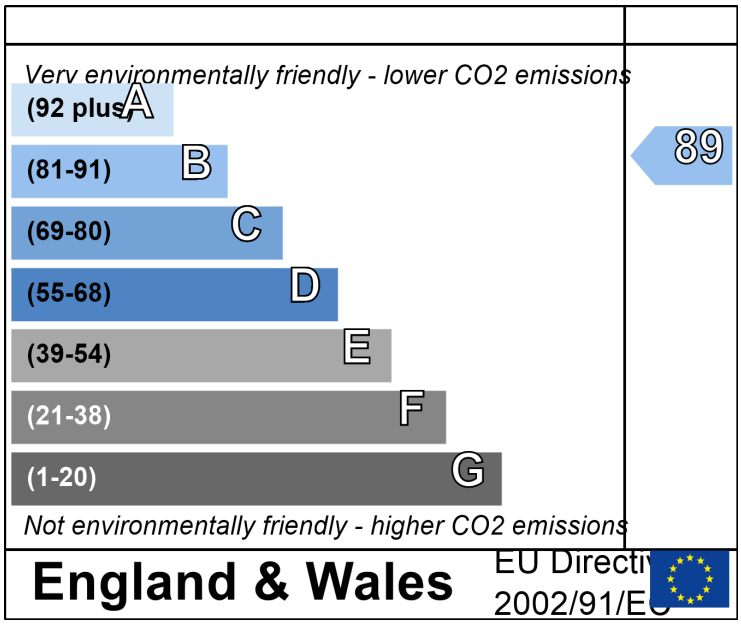
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 05

Address : FLAT 05, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.2	(1a) x	2.3	(2a) =	138.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		138.46	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

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

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			1.51	x1/[1/(1.1)+ 0.04]		=	1.59			(27)
Windows Type 2			1.1	x1/[1/(1.1)+ 0.04]		=	1.16			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Floor Type 1			56.8	x	0.11	=	6.248	75	4260	(28)
Floor Type 2			2.3	x	0.12	=	0.276	75	172.5	(28)
Floor Type 3			1.1	x	0.12	=	0.132	110	121	(28)
Walls Type1	11.04	2.1	8.94	x	0.19	=	1.7	14	125.16	(29)
Walls Type2	44.16	12.55	31.61	x	0.16	=	5.06	14	442.54	(29)
Total area of elements, m²			115.4							(31)
Party wall			21.85	x	0	=	0	20	437	(32)
Party ceiling			60.2					20	1204	(32b)
Internal wall **			124.2					9	1117.8	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.42 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7880 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 130.9 (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 — 17.31 (36)

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

Total fabric heat loss (33) + (36) = 45.73 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	16.34	16.14	15.94	14.94	14.74	13.74	13.74	13.54	14.14	14.74	15.14	15.54	(38)

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

(39)m=	62.07	61.87	61.67	60.67	60.47	59.47	59.47	59.27	59.87	60.47	60.87	61.27	

Average = Sum(39)$_{1...12}$ /12= 60.62 (39)

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

(40)m=	1.03	1.03	1.02	1.01	1	0.99	0.99	0.98	0.99	1	1.01	1.02	

Average = Sum(40)$_{1...12}$ /12= 1.01 (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 — 1.99 (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 — 81.4 (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=	89.54	86.28	83.03	79.77	76.51	73.26	73.26	76.51	79.77	83.03	86.28	89.54	

Total = Sum(44)$_{1...12}$ = 976.78 (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=	132.78	116.13	119.84	104.48	100.25	86.51	80.16	91.99	93.08	108.48	118.42	128.59	

Total = Sum(45)$_{1...12}$ = 1280.71 (45)

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

(46)m=	19.92	17.42	17.98	15.67	15.04	12.98	12.02	13.8	13.96	16.27	17.76	19.29	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	(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=	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	

Output from water heater (annual)$_{1...12}$ 1446.27 (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=	44.15	38.61	39.85	34.74	33.33	28.76	26.65	30.59	30.95	36.07	39.37	42.76	(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=	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	(66)

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

(67)m=	38.66	34.34	27.92	21.14	15.8	13.34	14.42	18.74	25.15	31.93	37.27	39.73	(67)

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

(68)m=	258.88	261.57	254.8	240.39	222.2	205.1	193.67	190.99	197.76	212.17	230.36	247.46	(68)

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

(69)m=	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	(70)

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

(71)m=	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	(71)

Water heating gains (Table 5)

(72)m=	59.34	57.46	53.56	48.25	44.8	39.95	35.82	41.11	42.99	48.48	54.69	57.47	(72)

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

(73)m=	453.85	450.33	433.24	406.74	379.76	355.35	340.88	347.8	362.86	389.55	419.28	441.63	(73)

6. Solar gains:

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

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 1	x	2.87	x	10.63	x	0.63	x	0.7	=	24.23	(74)
North	0.9x 1	x	2.87	x	20.32	x	0.63	x	0.7	=	46.3	(74)
North	0.9x 1	x	2.87	x	34.53	x	0.63	x	0.7	=	78.67	(74)
North	0.9x 1	x	2.87	x	55.46	x	0.63	x	0.7	=	126.36	(74)
North	0.9x 1	x	2.87	x	74.72	x	0.63	x	0.7	=	170.22	(74)
North	0.9x 1	x	2.87	x	79.99	x	0.63	x	0.7	=	182.22	(74)
North	0.9x 1	x	2.87	x	74.68	x	0.63	x	0.7	=	170.13	(74)
North	0.9x 1	x	2.87	x	59.25	x	0.63	x	0.7	=	134.98	(74)
North	0.9x 1	x	2.87	x	41.52	x	0.63	x	0.7	=	94.58	(74)
North	0.9x 1	x	2.87	x	24.19	x	0.63	x	0.7	=	55.11	(74)
North	0.9x 1	x	2.87	x	13.12	x	0.63	x	0.7	=	29.88	(74)
North	0.9x 1	x	2.87	x	8.86	x	0.63	x	0.7	=	20.2	(74)
Northeast	0.9x 1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4	(75)
Northeast	0.9x 1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14	(75)
Northeast	0.9x 1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49	(75)
Northeast	0.9x 1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64	(75)
Northeast	0.9x 1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14	(75)
Northeast	0.9x 1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17	(75)
Northeast	0.9x 1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93	(75)
Northeast	0.9x 1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53	(75)
Northeast	0.9x 1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03	(75)
Northeast	0.9x 1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39	(75)
Northeast	0.9x 1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(75)
Northeast	0.9x 1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(75)
South	0.9x 1	x	1.1	x	46.75	x	0.63	x	0.7	=	20.41	(78)
South	0.9x 1	x	1.1	x	76.57	x	0.63	x	0.7	=	33.43	(78)
South	0.9x 1	x	1.1	x	97.53	x	0.63	x	0.7	=	42.58	(78)
South	0.9x 1	x	1.1	x	110.23	x	0.63	x	0.7	=	48.13	(78)
South	0.9x 1	x	1.1	x	114.87	x	0.63	x	0.7	=	50.15	(78)
South	0.9x 1	x	1.1	x	110.55	x	0.63	x	0.7	=	48.26	(78)
South	0.9x 1	x	1.1	x	108.01	x	0.63	x	0.7	=	47.16	(78)
South	0.9x 1	x	1.1	x	104.89	x	0.63	x	0.7	=	45.8	(78)
South	0.9x 1	x	1.1	x	101.89	x	0.63	x	0.7	=	44.48	(78)
South	0.9x 1	x	1.1	x	82.59	x	0.63	x	0.7	=	36.06	(78)
South	0.9x 1	x	1.1	x	55.42	x	0.63	x	0.7	=	24.19	(78)
South	0.9x 1	x	1.1	x	40.4	x	0.63	x	0.7	=	17.64	(78)
West	0.9x 1	x	1.51	x	19.64	x	0.63	x	0.7	=	11.77	(80)
West	0.9x 1	x	1.51	x	38.42	x	0.63	x	0.7	=	23.03	(80)
West	0.9x 1	x	1.51	x	63.27	x	0.63	x	0.7	=	37.92	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	1	x	1.51	x	92.28	x	0.63	x	0.7	=	55.31	(80)
West	0.9x	1	x	1.51	x	113.09	x	0.63	x	0.7	=	67.78	(80)
West	0.9x	1	x	1.51	x	115.77	x	0.63	x	0.7	=	69.38	(80)
West	0.9x	1	x	1.51	x	110.22	x	0.63	x	0.7	=	66.06	(80)
West	0.9x	1	x	1.51	x	94.68	x	0.63	x	0.7	=	56.74	(80)
West	0.9x	1	x	1.51	x	73.59	x	0.63	x	0.7	=	44.1	(80)
West	0.9x	1	x	1.51	x	45.59	x	0.63	x	0.7	=	27.32	(80)
West	0.9x	1	x	1.51	x	24.49	x	0.63	x	0.7	=	14.68	(80)
West	0.9x	1	x	1.51	x	16.15	x	0.63	x	0.7	=	9.68	(80)
Northwest	0.9x	1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4	(81)
Northwest	0.9x	1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14	(81)
Northwest	0.9x	1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49	(81)
Northwest	0.9x	1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64	(81)
Northwest	0.9x	1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14	(81)
Northwest	0.9x	1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17	(81)
Northwest	0.9x	1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93	(81)
Northwest	0.9x	1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53	(81)
Northwest	0.9x	1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03	(81)
Northwest	0.9x	1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39	(81)
Northwest	0.9x	1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(81)
Northwest	0.9x	1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(81)

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

(83)m=	75.22	141.04	228.15	343.07	440.42	462.21	435.21	358.58	267.22	165.27	92.42	62.87	(83)

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

(84)m=	529.06	591.37	661.39	749.81	820.18	817.56	776.08	706.38	630.08	554.82	511.7	504.5	(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=	0.95	0.92	0.87	0.76	0.61	0.45	0.33	0.38	0.59	0.82	0.92	0.95	(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=	20.48	20.49	20.49	20.5	20.5	20.51	20.51	20.51	20.5	20.5	20.49	20.49	(88)

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

(89)m=	0.94	0.92	0.86	0.75	0.59	0.42	0.3	0.34	0.56	0.8	0.91	0.95	(89)

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

(90)m=	20.48	20.49	20.49	20.5	20.5	20.51	20.51	20.51	20.5	20.5	20.49	20.49	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

SAP WorkSheet: New dwelling design stage

(92)m=	20.7	20.7	20.7	20.71	20.71	20.72	20.72	20.72	20.71	20.71	20.71	20.71	(92)

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

(93)m=	20.7	20.7	20.7	20.71	20.71	20.72	20.72	20.72	20.71	20.71	20.71	20.71	(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=	0.94	0.92	0.87	0.76	0.6	0.43	0.31	0.36	0.57	0.81	0.92	0.95	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	498.98	542.76	572.38	566.2	490.67	351.04	241.61	250.93	361.81	449.07	468.42	479.23	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1018.14	977.8	876.02	716.5	544.88	363.69	244.74	255.83	395.96	611.4	828.37	1011.38	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	386.26	292.34	225.91	108.22	40.33	0	0	0	0	120.77	259.17	395.92	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1828.91 (98)

Space heating requirement in kWh/m²/year 30.38 (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 1 509.58 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	386.26	292.34	225.91	108.22	40.33	0	0	0	0	120.77	259.17	395.92	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	75.8	57.37	44.33	21.24	7.91	0	0	0	0	23.7	50.86	77.7	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 358.9 (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)

	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	75.62	66.35	68.96	60.81	58.87	51.56	48.52	54.61	54.95	63.11	67.99	73.46	

Total = Sum(219a)$_{1...12}$ = 744.81 (219)

SAP WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		358.9	
Water heating fuel used		744.81	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	160.48		(230a)
warm air heating system fans	83.08		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		243.55	(231)
Electricity for lighting		273.09	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1620.35	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year	
Space heating - main system 1	(211) x	13.19 x 0.01 =	47.34	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	13.19 x 0.01 =	98.24	(247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	32.12	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a				
Energy for lighting	(232)	13.19 x 0.01 =	36.02	(250)
Additional standing charges (Table 12)			0	(251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost (245)...(247) + (250)…(254) =			213.72	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.85	(257)
SAP rating (Section 12)	88.1	(258)

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

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519 =	186.27	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.519 =	386.56	(264)
Space and water heating	(261) + (262) + (263) + (264) =		572.83	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	126.4	(267)
Electricity for lighting	(232) x	0.519 =	141.73	(268)
Total CO2, kg/year sum of (265)…(271) =			840.96	(272)

SAP WorkSheet: New dwelling design stage

CO2 emissions per m²	(272) ÷ (4) =	13.97	(273)
EI rating (section 14)		89	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	1101.83	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	2286.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3388.4	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	747.7	(267)
Electricity for lighting	(232)	x	0	=	838.38	(268)
‘Total Primary Energy	sum of (265)…(271) =				4974.48	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				82.63	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 05

Address : FLAT 05, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.2 (1a)	x	2.3 (2a)	=	138.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	138.46	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.14	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

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

TER WorkSheet: New dwelling design stage

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

0.35	0.35	0.34	0.3	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.32

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=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(24d)

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

(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			1.51	x1/[1/(1.4)+ 0.04]		=	2			(27)
Windows Type 2			1.1	x1/[1/(1.4)+ 0.04]		=	1.46			(27)
Windows Type 3			2.87	x1/[1/(1.4)+ 0.04]		=	3.8			(27)
Windows Type 4			2.1	x1/[1/(1.4)+ 0.04]		=	2.78			(27)
Windows Type 5			2.1	x1/[1/(1.4)+ 0.04]		=	2.78			(27)
Floor Type 1			56.8	x	0.13	=	7.384			(28)
Floor Type 2			2.3	x	0.13	=	0.299			(28)
Floor Type 3			1.1	x	0.13	=	0.143			(28)
Walls Type1	11.04	2.1	8.94	x	0.18	=	1.61			(29)
Walls Type2	44.16	12.55	31.61	x	0.18	=	5.69			(29)
Total area of elements, m²			115.4							(31)
Party wall			21.85	x	0	=	0			(32)
Party ceiling			60.2							(32b)
Internal wall **			124.2							(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 33.86 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7880 (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 — 5.77 (36)

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

Total fabric heat loss (33) + (36) = 39.63 (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=	25.68	25.57	25.46	24.95	24.86	24.42	24.42	24.34	24.59	24.86	25.05	25.25	(38)

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

(39)m=	65.31	65.2	65.09	64.59	64.49	64.05	64.05	63.97	64.22	64.49	64.68	64.88	

Average = Sum(39)$_{1...12}$ /12= 64.59 (39)

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

(40)m=	1.08	1.08	1.08	1.07	1.07	1.06	1.06	1.06	1.07	1.07	1.07	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 — 1.99 (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 — 81.4 (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=	89.54	86.28	83.03	79.77	76.51	73.26	73.26	76.51	79.77	83.03	86.28	89.54	

Total = Sum(44)$_{1...12}$ = 976.78 (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=	132.78	116.13	119.84	104.48	100.25	86.51	80.16	91.99	93.08	108.48	118.42	128.59	

Total = Sum(45)$_{1...12}$ = 1280.71 (45)

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

(46)m=	19.92	17.42	17.98	15.67	15.04	12.98	12.02	13.8	13.96	16.27	17.76	19.29	(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): — 1.55 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (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)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0 (54)
Enter (50) or (54) in (55)		0.84 (55)

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

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	182.02	160.61	169.08	152.13	149.49	134.16	129.4	141.23	140.74	157.72	166.07	177.83	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

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

Output from water heater

(64)m=	182.02	160.61	169.08	152.13	149.49	134.16	129.4	141.23	140.74	157.72	166.07	177.83	

Output from water heater (annual)$_{1...12}$: 1860.5 (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=	83.54	74.2	79.24	72.86	72.73	66.89	66.05	69.98	69.07	75.46	77.5	82.15	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	(66)

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

(67)m=	15.51	13.78	11.21	8.48	6.34	5.35	5.79	7.52	10.09	12.82	14.96	15.95	(67)

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

(68)m=	173.45	175.25	170.72	161.06	148.87	137.41	129.76	127.96	132.5	142.15	154.34	165.8	(68)

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

(69)m=	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	(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=	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	(71)

Water heating gains (Table 5)

(72)m=	112.29	110.41	106.51	101.2	97.75	92.9	88.77	94.06	95.94	101.43	107.63	110.42	(72)

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

(73)m=	357.06	355.25	344.24	326.55	308.77	291.48	280.13	285.35	294.34	312.21	332.74	347.97	(73)

6. Solar gains:

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

TER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9x	0.77	x	2.87	x	10.63	x	0.63	x	0.7	=	18.65	(74)
North 0.9x	0.77	x	2.87	x	20.32	x	0.63	x	0.7	=	35.65	(74)
North 0.9x	0.77	x	2.87	x	34.53	x	0.63	x	0.7	=	60.57	(74)
North 0.9x	0.77	x	2.87	x	55.46	x	0.63	x	0.7	=	97.3	(74)
North 0.9x	0.77	x	2.87	x	74.72	x	0.63	x	0.7	=	131.07	(74)
North 0.9x	0.77	x	2.87	x	79.99	x	0.63	x	0.7	=	140.31	(74)
North 0.9x	0.77	x	2.87	x	74.68	x	0.63	x	0.7	=	131	(74)
North 0.9x	0.77	x	2.87	x	59.25	x	0.63	x	0.7	=	103.93	(74)
North 0.9x	0.77	x	2.87	x	41.52	x	0.63	x	0.7	=	72.83	(74)
North 0.9x	0.77	x	2.87	x	24.19	x	0.63	x	0.7	=	42.43	(74)
North 0.9x	0.77	x	2.87	x	13.12	x	0.63	x	0.7	=	23.01	(74)
North 0.9x	0.77	x	2.87	x	8.86	x	0.63	x	0.7	=	15.55	(74)
Northeast 0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(75)
Northeast 0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(75)
Northeast 0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(75)
Northeast 0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(75)
Northeast 0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(75)
Northeast 0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(75)
Northeast 0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(75)
Northeast 0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(75)
Northeast 0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(75)
Northeast 0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(75)
Northeast 0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(75)
Northeast 0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(75)
South 0.9x	0.77	x	1.1	x	46.75	x	0.63	x	0.7	=	15.72	(78)
South 0.9x	0.77	x	1.1	x	76.57	x	0.63	x	0.7	=	25.74	(78)
South 0.9x	0.77	x	1.1	x	97.53	x	0.63	x	0.7	=	32.79	(78)
South 0.9x	0.77	x	1.1	x	110.23	x	0.63	x	0.7	=	37.06	(78)
South 0.9x	0.77	x	1.1	x	114.87	x	0.63	x	0.7	=	38.62	(78)
South 0.9x	0.77	x	1.1	x	110.55	x	0.63	x	0.7	=	37.16	(78)
South 0.9x	0.77	x	1.1	x	108.01	x	0.63	x	0.7	=	36.31	(78)
South 0.9x	0.77	x	1.1	x	104.89	x	0.63	x	0.7	=	35.26	(78)
South 0.9x	0.77	x	1.1	x	101.89	x	0.63	x	0.7	=	34.25	(78)
South 0.9x	0.77	x	1.1	x	82.59	x	0.63	x	0.7	=	27.76	(78)
South 0.9x	0.77	x	1.1	x	55.42	x	0.63	x	0.7	=	18.63	(78)
South 0.9x	0.77	x	1.1	x	40.4	x	0.63	x	0.7	=	13.58	(78)
West 0.9x	0.77	x	1.51	x	19.64	x	0.63	x	0.7	=	9.06	(80)
West 0.9x	0.77	x	1.51	x	38.42	x	0.63	x	0.7	=	17.73	(80)
West 0.9x	0.77	x	1.51	x	63.27	x	0.63	x	0.7	=	29.2	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.51	x	92.28	x	0.63	x	0.7	=	42.59	(80)
West	0.9x	0.77	x	1.51	x	113.09	x	0.63	x	0.7	=	52.19	(80)
West	0.9x	0.77	x	1.51	x	115.77	x	0.63	x	0.7	=	53.43	(80)
West	0.9x	0.77	x	1.51	x	110.22	x	0.63	x	0.7	=	50.86	(80)
West	0.9x	0.77	x	1.51	x	94.68	x	0.63	x	0.7	=	43.69	(80)
West	0.9x	0.77	x	1.51	x	73.59	x	0.63	x	0.7	=	33.96	(80)
West	0.9x	0.77	x	1.51	x	45.59	x	0.63	x	0.7	=	21.04	(80)
West	0.9x	0.77	x	1.51	x	24.49	x	0.63	x	0.7	=	11.3	(80)
West	0.9x	0.77	x	1.51	x	16.15	x	0.63	x	0.7	=	7.45	(80)
Northwest	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(81)
Northwest	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(81)
Northwest	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(81)
Northwest	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(81)
Northwest	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(81)
Northwest	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(81)
Northwest	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(81)
Northwest	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(81)
Northwest	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(81)
Northwest	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(81)
Northwest	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(81)
Northwest	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(81)

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

(83)m=	57.92	108.6	175.67	264.17	339.12	355.9	335.11	276.11	205.76	127.26	71.16	48.41	(83)

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

(84)m=	414.98	463.85	519.91	590.72	647.9	647.38	615.24	561.46	500.09	439.47	403.91	396.38	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.93	0.81	0.61	0.45	0.52	0.79	0.96	0.99	1	(86)

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

(87)m=	19.93	20.07	20.31	20.64	20.88	20.98	21	20.99	20.92	20.61	20.21	19.9	(87)

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

(88)m=	20.01	20.01	20.02	20.02	20.02	20.03	20.03	20.03	20.03	20.02	20.02	20.02	(88)

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

(89)m=	0.99	0.99	0.97	0.91	0.75	0.53	0.36	0.41	0.71	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=	18.59	18.8	19.15	19.61	19.91	20.02	20.03	20.03	19.97	19.58	19.01	18.56	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

TER WorkSheet: New dwelling design stage

(92)m=	19.16	19.34	19.64	20.04	20.32	20.42	20.44	20.44	20.37	20.01	19.52	19.13	(92)

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

(93)m=	19.16	19.34	19.64	20.04	20.32	20.42	20.44	20.44	20.37	20.01	19.52	19.13	(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	0.91	0.77	0.56	0.4	0.46	0.74	0.94	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	412.26	458.15	504.55	538.71	499.62	364.5	244.78	256.06	369.73	414.48	398.62	394.31	(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=	970.56	941.24	855.58	719.64	556	373.03	245.88	258.25	402.8	607.06	803.33	968.48	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	415.37	324.64	261.17	130.27	41.95	0	0	0	0	143.27	291.39	427.18	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2035.25 (98)

Space heating requirement in kWh/m²/year 33.81 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.5 (206)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	415.37	324.64	261.17	130.27	41.95	0	0	0	0	143.27	291.39	427.18	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	444.25	347.2	279.32	139.33	44.86	0	0	0	0	153.23	311.65	456.88	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2176.73 (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)

	182.02	160.61	169.08	152.13	149.49	134.16	129.4	141.23	140.74	157.72	166.07	177.83	

Efficiency of water heater 79.8 (216)

(217)m=	86.95	86.65	85.97	84.4	81.92	79.8	79.8	79.8	79.8	84.56	86.3	87.07	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	209.35	185.34	196.67	180.24	182.48	168.12	162.16	176.98	176.36	186.53	192.44	204.25	

Total = Sum(219a)$_{1...12}$ = 2220.93 (219)

TER WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2176.73	
Water heating fuel used		2220.93	
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		273.98	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4746.64	(338)

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

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	470.17	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	479.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =				949.89	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	142.2	(268)
Total CO2, kg/year	sum of (265)…(271) =				1131.02	(272)

TER = 27.47 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:18

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 73m²

Site Reference : 43LS **Plot Reference:** FLAT 06

Address : FLAT 06, 43 London Street, Reading, RG1 4PS

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	26.02 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.15 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.19 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.03 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

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

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.76	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: East	1.75m²
Windows facing: North	1.14m²
Windows facing: North	5.74m²
Windows facing: North West	2.1m²
Windows facing: North East	2.1m²
Windows facing: South	1.16m²
Windows facing: East	3.72m²
Ventilation rate:	2.50
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.85 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.11 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 06

Address : FLAT 06, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73	(1a) x	2.3	(2a) =	167.9	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		167.9	(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		5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

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

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			1.75	x1/[1/(1.1)+ 0.04]		=	1.84			(27)
Windows Type 2			1.14	x1/[1/(1.1)+ 0.04]		=	1.2			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 6			1.16	x1/[1/(0.92)+ 0.04]		=	1.03			(27)
Windows Type 7			3.72	x1/[1/(0.92)+ 0.04]		=	3.3			(27)
Floor			73	x	0.11	=	8.03	110	8030	(28)
Walls Type1	17.02	2.1	14.92	x	0.19	=	2.83	14	208.88	(29)
Walls Type2	45.08	17.71	27.37	x	0.16	=	4.38	14	383.18	(29)
Total area of elements, m²			135.1							(31)
Party wall			31.51	x	0	=	0	20	630.2	(32)
Party ceiling			73					20	1460	(32b)
Internal wall **			140.3					9	1262.7	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11974.96 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 164.04 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 20.27 (36)

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

Total fabric heat loss (33) + (36) = — 55.14 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	19.81	19.57	19.33	18.12	17.88	16.66	16.66	16.42	17.15	17.88	18.36	18.85	(38)

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

(39)m=	74.96	74.71	74.47	73.26	73.02	71.81	71.81	71.56	72.29	73.02	73.5	73.99	

Average = Sum(39)$_{1...12}$ /12= 73.2 (39)

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 — 2.32 (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 — 89.22 (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=	98.14	94.57	91.01	87.44	83.87	80.3	80.3	83.87	87.44	91.01	94.57	98.14	

Total = Sum(44)$_{1...12}$ = 1070.66 (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=	145.54	127.29	131.36	114.52	109.88	94.82	87.87	100.83	102.03	118.91	129.8	140.95	

Total = Sum(45)$_{1...12}$ = 1403.8 (45)

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

(46)m=	21.83	19.09	19.7	17.18	16.48	14.22	13.18	15.12	15.3	17.84	19.47	21.14	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	159.61	139.99	145.42	128.13	123.95	108.43	101.93	114.89	115.64	132.97	143.41	155.01	(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=	159.61	139.99	145.42	128.13	123.95	108.43	101.93	114.89	115.64	132.97	143.41	155.01	

Output from water heater (annual)$_{1...12}$	1569.37	(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=	48.39	42.33	43.68	38.08	36.54	31.53	29.22	33.53	33.93	39.54	43.16	46.87	(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=	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	(66)

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

(67)m=	18.2	16.17	13.15	9.95	7.44	6.28	6.79	8.82	11.84	15.04	17.55	18.71	(67)

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

(68)m=	204.2	206.31	200.97	189.61	175.26	161.77	152.76	150.64	155.98	167.35	181.7	195.19	(68)

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

(69)m=	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	(69)

Pumps and fans gains (Table 5a)

(70)m=	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	(70)

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

(71)m=	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	(71)

Water heating gains (Table 5)

(72)m=	65.05	62.98	58.7	52.89	49.11	43.79	39.27	45.06	47.12	53.14	59.94	62.99	(72)

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

(73)m=	355.27	353.29	340.65	320.27	299.63	279.67	266.64	272.35	282.77	303.35	327.02	344.71	(73)

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9x	0.77	x	1.14	x	10.63	x	0.63	x	0.7	=	3.7	(74)
North 0.9x	0.77	x	2.87	x	10.63	x	0.63	x	0.7	=	18.65	(74)
North 0.9x	0.77	x	1.14	x	20.32	x	0.63	x	0.7	=	7.08	(74)
North 0.9x	0.77	x	2.87	x	20.32	x	0.63	x	0.7	=	35.65	(74)
North 0.9x	0.77	x	1.14	x	34.53	x	0.63	x	0.7	=	12.03	(74)
North 0.9x	0.77	x	2.87	x	34.53	x	0.63	x	0.7	=	60.57	(74)
North 0.9x	0.77	x	1.14	x	55.46	x	0.63	x	0.7	=	19.32	(74)
North 0.9x	0.77	x	2.87	x	55.46	x	0.63	x	0.7	=	97.3	(74)
North 0.9x	0.77	x	1.14	x	74.72	x	0.63	x	0.7	=	26.03	(74)
North 0.9x	0.77	x	2.87	x	74.72	x	0.63	x	0.7	=	131.07	(74)
North 0.9x	0.77	x	1.14	x	79.99	x	0.63	x	0.7	=	27.87	(74)
North 0.9x	0.77	x	2.87	x	79.99	x	0.63	x	0.7	=	140.31	(74)
North 0.9x	0.77	x	1.14	x	74.68	x	0.63	x	0.7	=	26.02	(74)
North 0.9x	0.77	x	2.87	x	74.68	x	0.63	x	0.7	=	131	(74)
North 0.9x	0.77	x	1.14	x	59.25	x	0.63	x	0.7	=	20.64	(74)
North 0.9x	0.77	x	2.87	x	59.25	x	0.63	x	0.7	=	103.93	(74)
North 0.9x	0.77	x	1.14	x	41.52	x	0.63	x	0.7	=	14.46	(74)
North 0.9x	0.77	x	2.87	x	41.52	x	0.63	x	0.7	=	72.83	(74)
North 0.9x	0.77	x	1.14	x	24.19	x	0.63	x	0.7	=	8.43	(74)
North 0.9x	0.77	x	2.87	x	24.19	x	0.63	x	0.7	=	42.43	(74)
North 0.9x	0.77	x	1.14	x	13.12	x	0.63	x	0.7	=	4.57	(74)
North 0.9x	0.77	x	2.87	x	13.12	x	0.63	x	0.7	=	23.01	(74)
North 0.9x	0.77	x	1.14	x	8.86	x	0.63	x	0.7	=	3.09	(74)
North 0.9x	0.77	x	2.87	x	8.86	x	0.63	x	0.7	=	15.55	(74)
Northeast 0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(75)
Northeast 0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(75)
Northeast 0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(75)
Northeast 0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(75)
Northeast 0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(75)
Northeast 0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(75)
Northeast 0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(75)
Northeast 0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(75)
Northeast 0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(75)
Northeast 0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(75)
Northeast 0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(75)
Northeast 0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(75)
East 0.9x	0.77	x	1.75	x	19.64	x	0.63	x	0.7	=	10.5	(76)
East 0.9x	0.77	x	3.72	x	19.64	x	0.51	x	0.8	=	20.66	(76)
East 0.9x	0.77	x	1.75	x	38.42	x	0.63	x	0.7	=	20.55	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	3.72	x	38.42	x	0.51	x	0.8	=	40.41	(76)
East	0.9x	0.77	x	1.75	x	63.27	x	0.63	x	0.7	=	33.84	(76)
East	0.9x	0.77	x	3.72	x	63.27	x	0.51	x	0.8	=	66.55	(76)
East	0.9x	0.77	x	1.75	x	92.28	x	0.63	x	0.7	=	49.35	(76)
East	0.9x	0.77	x	3.72	x	92.28	x	0.51	x	0.8	=	97.06	(76)
East	0.9x	0.77	x	1.75	x	113.09	x	0.63	x	0.7	=	60.48	(76)
East	0.9x	0.77	x	3.72	x	113.09	x	0.51	x	0.8	=	118.95	(76)
East	0.9x	0.77	x	1.75	x	115.77	x	0.63	x	0.7	=	61.92	(76)
East	0.9x	0.77	x	3.72	x	115.77	x	0.51	x	0.8	=	121.77	(76)
East	0.9x	0.77	x	1.75	x	110.22	x	0.63	x	0.7	=	58.95	(76)
East	0.9x	0.77	x	3.72	x	110.22	x	0.51	x	0.8	=	115.93	(76)
East	0.9x	0.77	x	1.75	x	94.68	x	0.63	x	0.7	=	50.63	(76)
East	0.9x	0.77	x	3.72	x	94.68	x	0.51	x	0.8	=	99.58	(76)
East	0.9x	0.77	x	1.75	x	73.59	x	0.63	x	0.7	=	39.36	(76)
East	0.9x	0.77	x	3.72	x	73.59	x	0.51	x	0.8	=	77.4	(76)
East	0.9x	0.77	x	1.75	x	45.59	x	0.63	x	0.7	=	24.38	(76)
East	0.9x	0.77	x	3.72	x	45.59	x	0.51	x	0.8	=	47.95	(76)
East	0.9x	0.77	x	1.75	x	24.49	x	0.63	x	0.7	=	13.1	(76)
East	0.9x	0.77	x	3.72	x	24.49	x	0.51	x	0.8	=	25.76	(76)
East	0.9x	0.77	x	1.75	x	16.15	x	0.63	x	0.7	=	8.64	(76)
East	0.9x	0.77	x	3.72	x	16.15	x	0.51	x	0.8	=	16.99	(76)
South	0.9x	0.77	x	1.16	x	46.75	x	0.51	x	0.8	=	15.33	(78)
South	0.9x	0.77	x	1.16	x	76.57	x	0.51	x	0.8	=	25.11	(78)
South	0.9x	0.77	x	1.16	x	97.53	x	0.51	x	0.8	=	31.99	(78)
South	0.9x	0.77	x	1.16	x	110.23	x	0.51	x	0.8	=	36.16	(78)
South	0.9x	0.77	x	1.16	x	114.87	x	0.51	x	0.8	=	37.68	(78)
South	0.9x	0.77	x	1.16	x	110.55	x	0.51	x	0.8	=	36.26	(78)
South	0.9x	0.77	x	1.16	x	108.01	x	0.51	x	0.8	=	35.43	(78)
South	0.9x	0.77	x	1.16	x	104.89	x	0.51	x	0.8	=	34.4	(78)
South	0.9x	0.77	x	1.16	x	101.89	x	0.51	x	0.8	=	33.42	(78)
South	0.9x	0.77	x	1.16	x	82.59	x	0.51	x	0.8	=	27.09	(78)
South	0.9x	0.77	x	1.16	x	55.42	x	0.51	x	0.8	=	18.18	(78)
South	0.9x	0.77	x	1.16	x	40.4	x	0.51	x	0.8	=	13.25	(78)
Northwest	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(81)
Northwest	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(81)
Northwest	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(81)
Northwest	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(81)
Northwest	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(81)
Northwest	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(81)
Northwest	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(81)
Northwest	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(81)

DER WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(81)
Northwest	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(81)
Northwest	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(81)
Northwest	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(81)

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

(83)m=	83.34	158.28	258.1	386.42	491.46	513.12	484.25	402.41	302.19	186.31	102.84	69.34	(83)

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

(84)m=	438.61	511.57	598.75	706.69	791.09	792.79	750.9	674.77	584.96	489.66	429.85	414.05	(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=	0.99	0.98	0.95	0.88	0.74	0.55	0.41	0.47	0.73	0.93	0.98	0.99	(86)

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

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

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

(88)m=	20.49	20.49	20.49	20.5	20.5	20.51	20.51	20.51	20.5	20.5	20.5	20.49	(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	0.51	0.37	0.43	0.7	0.92	0.98	0.99	(89)

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

(90)m=	20.49	20.49	20.49	20.5	20.5	20.51	20.51	20.51	20.5	20.5	20.5	20.49	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

(92)m=	20.7	20.71	20.71	20.71	20.71	20.72	20.72	20.72	20.72	20.71	20.71	20.71	(92)

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

(93)m=	20.7	20.71	20.71	20.71	20.71	20.72	20.72	20.72	20.72	20.71	20.71	20.71	(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	0.98	0.95	0.87	0.72	0.53	0.39	0.45	0.71	0.93	0.98	0.99	(94)

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

(95)m=	433.81	500.92	570.06	616.94	570.99	420.81	291.63	302.06	418.11	453.7	421.49	410.41	(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=	1229.65	1180.91	1058	865.3	658.06	439.24	295.63	309.01	478.21	738.38	1000.4	1221.42	(97)

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

(98)m=	592.1	456.96	363.02	178.82	64.78	0	0	0	0	211.8	416.81	603.39	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 2887.68 (98)

Space heating requirement in kWh/m²/year 39.56 (99)

DER WorkSheet: New dwelling design stage

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		511.44 (206)
Efficiency of secondary/supplementary heating system, %		100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	592.1	456.96	363.02	178.82	64.78	0	0	0	0	211.8	416.81	603.39	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	115.77	89.35	70.98	34.96	12.67	0	0	0	0	41.41	81.5	117.98	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 564.62 (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)

	159.61	139.99	145.42	128.13	123.95	108.43	101.93	114.89	115.64	132.97	143.41	155.01	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

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

(219)m=	82.19	72.1	74.89	65.98	63.83	55.84	52.49	59.17	59.55	68.48	73.85	79.83	

Total = Sum(219a)$_{1...12}$ = 808.2 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		564.62
Water heating fuel used		808.2
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	194.6	(230a)
warm air heating system fans	100.74	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		295.34 (231)
Electricity for lighting		321.49 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1989.65 (338)

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

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.519	=	293.04	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	419.46	(264)

DER WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			712.49	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	153.28	(267)
Electricity for lighting	(232) x	0.519	=	166.85	(268)
Total CO2, kg/year	sum of (265)…(271) =			1032.63	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			14.15	(273)
EI rating (section 14)				88	(274)

Predicted Energy Assessment

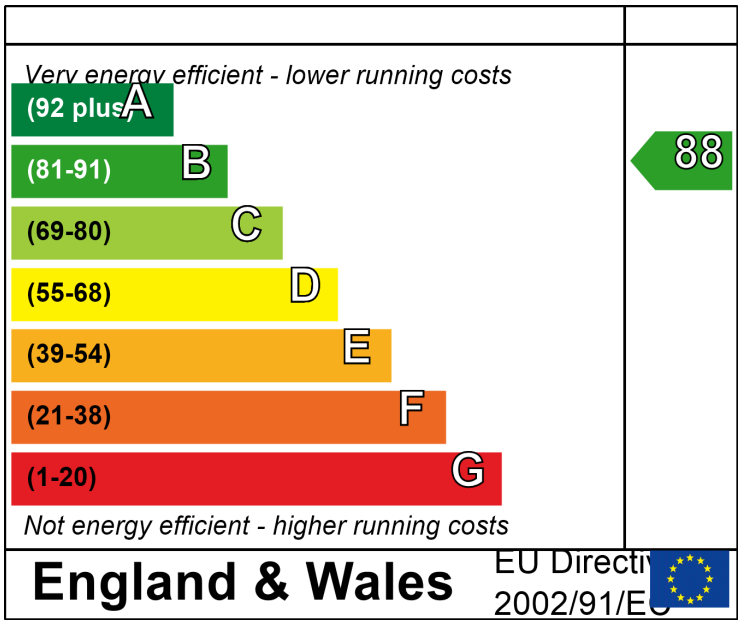
FLAT 06
43 London Street
Reading
RG1 4PS

Dwelling type: Ground floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 73 m²

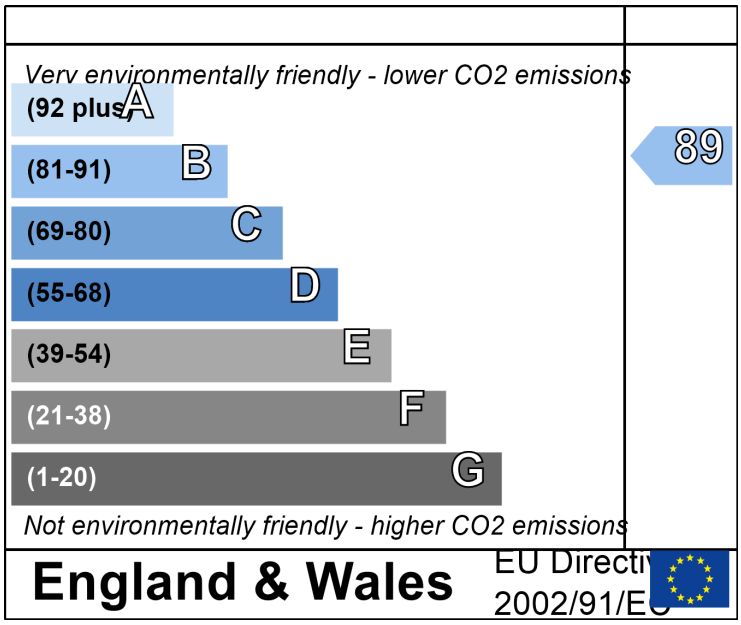
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 06

Address : FLAT 06, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73	(1a) x	2.3	(2a) =	167.9	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		167.9	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

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

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			1.75	x1/[1/(1.1)+ 0.04]		=	1.84			(27)
Windows Type 2			1.14	x1/[1/(1.1)+ 0.04]		=	1.2			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 6			1.16	x1/[1/(0.92)+ 0.04]		=	1.03			(27)
Windows Type 7			3.72	x1/[1/(0.92)+ 0.04]		=	3.3			(27)
Floor			73	x	0.11	=	8.03	110	8030	(28)
Walls Type1	17.02	2.1	14.92	x	0.19	=	2.83	14	208.88	(29)
Walls Type2	45.08	17.71	27.37	x	0.16	=	4.38	14	383.18	(29)
Total area of elements, m²			135.1							(31)
Party wall			31.51	x	0	=	0	20	630.2	(32)
Party ceiling			73					20	1460	(32b)
Internal wall **			140.3					9	1262.7	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11974.96 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 164.04 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 20.27 (36)

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

Total fabric heat loss (33) + (36) = 55.14 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	19.81	19.57	19.33	18.12	17.88	16.66	16.66	16.42	17.15	17.88	18.36	18.85	(38)

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

(39)m=	74.96	74.71	74.47	73.26	73.02	71.81	71.81	71.56	72.29	73.02	73.5	73.99	

Average = Sum(39)$_{1...12}$ /12= 73.2 (39)

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 — 2.32 (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 — 89.22 (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	
(44)m=	98.14	94.57	91.01	87.44	83.87	80.3	80.3	83.87	87.44	91.01	94.57	98.14	

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

Total = Sum(44)$_{1...12}$ = 1070.66 (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=	145.54	127.29	131.36	114.52	109.88	94.82	87.87	100.83	102.03	118.91	129.8	140.95	

Total = Sum(45)$_{1...12}$ = 1403.8 (45)

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

(46)m=	21.83	19.09	19.7	17.18	16.48	14.22	13.18	15.12	15.3	17.84	19.47	21.14	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0 (54)
Enter (50) or (54) in (55)		0.45 (55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

(62)m=	159.61	139.99	145.42	128.13	123.95	108.43	101.93	114.89	115.64	132.97	143.41	155.01	(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=	159.61	139.99	145.42	128.13	123.95	108.43	101.93	114.89	115.64	132.97	143.41	155.01	

Output from water heater (annual)$_{1...12}$: 1569.37 (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=	48.39	42.33	43.68	38.08	36.54	31.53	29.22	33.53	33.93	39.54	43.16	46.87	(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=	139	139	139	139	139	139	139	139	139	139	139	139	(66)

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

(67)m=	45.51	40.42	32.87	24.89	18.6	15.71	16.97	22.06	29.61	37.59	43.88	46.78	(67)

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

(68)m=	304.77	307.93	299.96	283	261.58	241.45	228	224.84	232.81	249.78	271.19	291.32	(68)

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

(69)m=	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	(69)

Pumps and fans gains (Table 5a)

(70)m=	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	10.07	(70)

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

(71)m=	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	(71)

Water heating gains (Table 5)

(72)m=	65.05	62.98	58.7	52.89	49.11	43.79	39.27	45.06	47.12	53.14	59.94	62.99	(72)

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

(73)m=	522.95	518.96	499.16	468.39	436.92	408.57	391.87	399.59	417.16	448.14	482.64	508.71	(73)

6. Solar gains:

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

SAP WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	1	x	1.14	x	10.63	x	0.63	x	0.7	=	4.81	(74)
North	0.9x	1	x	2.87	x	10.63	x	0.63	x	0.7	=	24.23	(74)
North	0.9x	1	x	1.14	x	20.32	x	0.63	x	0.7	=	9.19	(74)
North	0.9x	1	x	2.87	x	20.32	x	0.63	x	0.7	=	46.3	(74)
North	0.9x	1	x	1.14	x	34.53	x	0.63	x	0.7	=	15.62	(74)
North	0.9x	1	x	2.87	x	34.53	x	0.63	x	0.7	=	78.67	(74)
North	0.9x	1	x	1.14	x	55.46	x	0.63	x	0.7	=	25.1	(74)
North	0.9x	1	x	2.87	x	55.46	x	0.63	x	0.7	=	126.36	(74)
North	0.9x	1	x	1.14	x	74.72	x	0.63	x	0.7	=	33.81	(74)
North	0.9x	1	x	2.87	x	74.72	x	0.63	x	0.7	=	170.22	(74)
North	0.9x	1	x	1.14	x	79.99	x	0.63	x	0.7	=	36.19	(74)
North	0.9x	1	x	2.87	x	79.99	x	0.63	x	0.7	=	182.22	(74)
North	0.9x	1	x	1.14	x	74.68	x	0.63	x	0.7	=	33.79	(74)
North	0.9x	1	x	2.87	x	74.68	x	0.63	x	0.7	=	170.13	(74)
North	0.9x	1	x	1.14	x	59.25	x	0.63	x	0.7	=	26.81	(74)
North	0.9x	1	x	2.87	x	59.25	x	0.63	x	0.7	=	134.98	(74)
North	0.9x	1	x	1.14	x	41.52	x	0.63	x	0.7	=	18.78	(74)
North	0.9x	1	x	2.87	x	41.52	x	0.63	x	0.7	=	94.58	(74)
North	0.9x	1	x	1.14	x	24.19	x	0.63	x	0.7	=	10.94	(74)
North	0.9x	1	x	2.87	x	24.19	x	0.63	x	0.7	=	55.11	(74)
North	0.9x	1	x	1.14	x	13.12	x	0.63	x	0.7	=	5.94	(74)
North	0.9x	1	x	2.87	x	13.12	x	0.63	x	0.7	=	29.88	(74)
North	0.9x	1	x	1.14	x	8.86	x	0.63	x	0.7	=	4.01	(74)
North	0.9x	1	x	2.87	x	8.86	x	0.63	x	0.7	=	20.2	(74)
Northeast	0.9x	1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4	(75)
Northeast	0.9x	1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14	(75)
Northeast	0.9x	1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49	(75)
Northeast	0.9x	1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64	(75)
Northeast	0.9x	1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14	(75)
Northeast	0.9x	1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17	(75)
Northeast	0.9x	1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93	(75)
Northeast	0.9x	1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53	(75)
Northeast	0.9x	1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03	(75)
Northeast	0.9x	1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39	(75)
Northeast	0.9x	1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(75)
Northeast	0.9x	1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(75)
East	0.9x	1	x	1.75	x	19.64	x	0.63	x	0.7	=	13.64	(76)
East	0.9x	1	x	3.72	x	19.64	x	0.51	x	0.8	=	26.83	(76)
East	0.9x	1	x	1.75	x	38.42	x	0.63	x	0.7	=	26.69	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	1	x	3.72	x	38.42	x	0.51	x	0.8	=	52.48	(76)
East	0.9x	1	x	1.75	x	63.27	x	0.63	x	0.7	=	43.95	(76)
East	0.9x	1	x	3.72	x	63.27	x	0.51	x	0.8	=	86.43	(76)
East	0.9x	1	x	1.75	x	92.28	x	0.63	x	0.7	=	64.1	(76)
East	0.9x	1	x	3.72	x	92.28	x	0.51	x	0.8	=	126.05	(76)
East	0.9x	1	x	1.75	x	113.09	x	0.63	x	0.7	=	78.55	(76)
East	0.9x	1	x	3.72	x	113.09	x	0.51	x	0.8	=	154.48	(76)
East	0.9x	1	x	1.75	x	115.77	x	0.63	x	0.7	=	80.41	(76)
East	0.9x	1	x	3.72	x	115.77	x	0.51	x	0.8	=	158.14	(76)
East	0.9x	1	x	1.75	x	110.22	x	0.63	x	0.7	=	76.55	(76)
East	0.9x	1	x	3.72	x	110.22	x	0.51	x	0.8	=	150.56	(76)
East	0.9x	1	x	1.75	x	94.68	x	0.63	x	0.7	=	65.76	(76)
East	0.9x	1	x	3.72	x	94.68	x	0.51	x	0.8	=	129.33	(76)
East	0.9x	1	x	1.75	x	73.59	x	0.63	x	0.7	=	51.11	(76)
East	0.9x	1	x	3.72	x	73.59	x	0.51	x	0.8	=	100.52	(76)
East	0.9x	1	x	1.75	x	45.59	x	0.63	x	0.7	=	31.67	(76)
East	0.9x	1	x	3.72	x	45.59	x	0.51	x	0.8	=	62.27	(76)
East	0.9x	1	x	1.75	x	24.49	x	0.63	x	0.7	=	17.01	(76)
East	0.9x	1	x	3.72	x	24.49	x	0.51	x	0.8	=	33.45	(76)
East	0.9x	1	x	1.75	x	16.15	x	0.63	x	0.7	=	11.22	(76)
East	0.9x	1	x	3.72	x	16.15	x	0.51	x	0.8	=	22.06	(76)
South	0.9x	1	x	1.16	x	46.75	x	0.51	x	0.8	=	19.91	(78)
South	0.9x	1	x	1.16	x	76.57	x	0.51	x	0.8	=	32.61	(78)
South	0.9x	1	x	1.16	x	97.53	x	0.51	x	0.8	=	41.54	(78)
South	0.9x	1	x	1.16	x	110.23	x	0.51	x	0.8	=	46.95	(78)
South	0.9x	1	x	1.16	x	114.87	x	0.51	x	0.8	=	48.93	(78)
South	0.9x	1	x	1.16	x	110.55	x	0.51	x	0.8	=	47.09	(78)
South	0.9x	1	x	1.16	x	108.01	x	0.51	x	0.8	=	46.01	(78)
South	0.9x	1	x	1.16	x	104.89	x	0.51	x	0.8	=	44.68	(78)
South	0.9x	1	x	1.16	x	101.89	x	0.51	x	0.8	=	43.4	(78)
South	0.9x	1	x	1.16	x	82.59	x	0.51	x	0.8	=	35.18	(78)
South	0.9x	1	x	1.16	x	55.42	x	0.51	x	0.8	=	23.61	(78)
South	0.9x	1	x	1.16	x	40.4	x	0.51	x	0.8	=	17.21	(78)
Northwest	0.9x	1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4	(81)
Northwest	0.9x	1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14	(81)
Northwest	0.9x	1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49	(81)
Northwest	0.9x	1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64	(81)
Northwest	0.9x	1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14	(81)
Northwest	0.9x	1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17	(81)
Northwest	0.9x	1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93	(81)
Northwest	0.9x	1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53	(81)

SAP WorkSheet: New dwelling design stage

Northwest 0.9x	1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03	(81)
Northwest 0.9x	1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39	(81)
Northwest 0.9x	1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(81)
Northwest 0.9x	1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(81)

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

(83)m=	108.23	205.56	335.19	501.84	638.26	666.39	628.9	522.62	392.45	241.96	133.55	90.05	(83)

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

(84)m=	631.18	724.52	834.36	970.23	1075.18	1074.96	1020.77	922.2	809.61	690.09	616.19	598.77	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.94	0.89	0.76	0.59	0.42	0.31	0.35	0.58	0.84	0.94	0.97	(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=	20.49	20.49	20.49	20.5	20.5	20.51	20.51	20.51	20.5	20.5	20.5	20.49	(88)

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

(89)m=	0.96	0.94	0.88	0.74	0.57	0.39	0.27	0.32	0.55	0.82	0.94	0.97	(89)

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

(90)m=	20.49	20.49	20.49	20.5	20.5	20.51	20.51	20.51	20.5	20.5	20.5	20.49	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

(92)m=	20.7	20.71	20.71	20.71	20.71	20.72	20.72	20.72	20.72	20.71	20.71	20.71	(92)

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

(93)m=	20.7	20.71	20.71	20.71	20.71	20.72	20.72	20.72	20.72	20.71	20.71	20.71	(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=	0.96	0.94	0.88	0.75	0.58	0.4	0.29	0.33	0.56	0.83	0.94	0.97	(94)

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

(95)m=	608.42	680.32	735.45	730.39	619.64	432.48	294.3	306.68	453.5	571.13	579.15	580.59	(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=	1229.65	1180.91	1058	865.3	658.06	439.24	295.63	309.01	478.21	738.38	1000.4	1221.42	(97)

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

(98)m=	462.19	336.4	239.98	97.13	28.58	0	0	0	0	124.44	303.3	476.78	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2068.8 (98)

Space heating requirement in kWh/m²/year 28.34 (99)

SAP WorkSheet: New dwelling design stage

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		511.44 (206)
Efficiency of secondary/supplementary heating system, %		100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	462.19	336.4	239.98	97.13	28.58	0	0	0	0	124.44	303.3	476.78	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	90.37	65.77	46.92	18.99	5.59	0	0	0	0	24.33	59.3	93.22	(211)

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 404.5 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)	159.61	139.99	145.42	128.13	123.95	108.43	101.93	114.89	115.64	132.97	143.41	155.01

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	82.19	72.1	74.89	65.98	63.83	55.84	52.49	59.17	59.55	68.48	73.85	79.83

Total = Sum(219a)$_{1...12}$ = 808.2 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		404.5
Water heating fuel used		808.2
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	194.6	(230a)
warm air heating system fans	100.74	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		295.34 (231)
Electricity for lighting		321.49 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1829.53 (338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year
Space heating - main system 1	(211) x	13.19 x 0.01 =	53.35 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	13.19	x 0.01 =	106.6	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	38.95	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a					
Energy for lighting	(232)	13.19	x 0.01 =	42.4	(250)
Additional standing charges (Table 12)				0	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			241.32	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.86	(257)
SAP rating (Section 12)		88.02	(258)

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

		Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	209.94	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	419.46	(264)
Space and water heating	(261) + (262) + (263) + (264) =				629.39	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	153.28	(267)
Electricity for lighting	(232) x		0.519	=	166.85	(268)
Total CO2, kg/year	sum of (265)…(271) =				949.53	(272)
CO2 emissions per m²	(272) ÷ (4) =				13.01	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	1241.83	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2481.18	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3723.01	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	906.68	(267)
Electricity for lighting	(232) x		0	=	986.98	(268)
'Total Primary Energy	sum of (265)…(271) =				5616.67	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				76.94	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 06

Address : FLAT 06, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73 (1a)	x	2.3 (2a)	=	167.9	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	167.9	(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) =	0.18	(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)			0.43	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.3	(21)

Infiltration rate modified for monthly wind speed

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

TER WorkSheet: New dwelling design stage

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

0.38	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			1.6	x1/[1/(1.4)+ 0.04]		=	2.12			(27)
Windows Type 2			1.04	x1/[1/(1.4)+ 0.04]		=	1.38			(27)
Windows Type 3			2.62	x1/[1/(1.4)+ 0.04]		=	3.47			(27)
Windows Type 4			1.92	x1/[1/(1.4)+ 0.04]		=	2.55			(27)
Windows Type 5			1.92	x1/[1/(1.4)+ 0.04]		=	2.55			(27)
Windows Type 6			1.06	x1/[1/(1.4)+ 0.04]		=	1.41			(27)
Windows Type 7			3.39	x1/[1/(1.4)+ 0.04]		=	4.49			(27)
Floor			73	x	0.13	=	9.49			(28)
Walls Type1	17.02	2.1	14.92	x	0.18	=	2.69			(29)
Walls Type2	45.08	16.17	28.91	x	0.18	=	5.2			(29)
Total area of elements, m²			135.1							(31)
Party wall			31.51	x	0	=	0			(32)
Party ceiling			73							(32b)
Internal wall **			140.3							(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 40.92 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11996.52 (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 — 6.76 (36)

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

Total fabric heat loss (33) + (36) = 47.67 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	31.76	31.6	31.45	30.72	30.59	29.95	29.95	29.84	30.2	30.59	30.86	31.15	(38)

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

(39)m=	79.43	79.27	79.12	78.39	78.26	77.63	77.63	77.51	77.87	78.26	78.53	78.82	

Average = Sum(39)$_{1...12}$ /12= 78.39 (39)

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

(40)m=	1.09	1.09	1.08	1.07	1.07	1.06	1.06	1.06	1.07	1.07	1.08	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 — 2.32 (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 — 89.22 (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=	98.14	94.57	91.01	87.44	83.87	80.3	80.3	83.87	87.44	91.01	94.57	98.14	

Total = Sum(44)$_{1...12}$ = 1070.66 (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=	145.54	127.29	131.36	114.52	109.88	94.82	87.87	100.83	102.03	118.91	129.8	140.95	

Total = Sum(45)$_{1...12}$ = 1403.8 (45)

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

(46)m=	21.83	19.09	19.7	17.18	16.48	14.22	13.18	15.12	15.3	17.84	19.47	21.14	(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): — 1.55 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0.84 (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)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

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

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	194.79	171.77	180.6	162.17	159.13	142.48	137.11	150.07	149.69	168.15	177.45	190.19	(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=	194.79	171.77	180.6	162.17	159.13	142.48	137.11	150.07	149.69	168.15	177.45	190.19	

Output from water heater (annual)$_{1...12}$ 1983.6 (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=	87.79	77.91	83.07	76.2	75.93	69.65	68.61	72.92	72.05	78.93	81.28	86.26	(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=	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	115.84	(66)

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

(67)m=	18.21	16.17	13.15	9.96	7.44	6.28	6.79	8.82	11.84	15.04	17.55	18.71	(67)

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

(68)m=	204.2	206.31	200.97	189.61	175.26	161.77	152.76	150.64	155.98	167.35	181.7	195.19	(68)

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

(69)m=	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	34.58	(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=	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	(71)

Water heating gains (Table 5)

(72)m=	117.99	115.93	111.65	105.83	102.06	96.74	92.22	98.01	100.07	106.09	112.89	115.94	(72)

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

(73)m=	401.15	399.17	386.53	366.15	345.51	325.54	312.52	318.23	328.65	349.23	372.89	390.59	(73)

6. Solar gains:

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

TER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.04	x	10.63	x	0.63	x	0.7	=	3.38	(74)
North	0.9x	0.77	x	2.62	x	10.63	x	0.63	x	0.7	=	17.03	(74)
North	0.9x	0.77	x	1.04	x	20.32	x	0.63	x	0.7	=	6.46	(74)
North	0.9x	0.77	x	2.62	x	20.32	x	0.63	x	0.7	=	32.54	(74)
North	0.9x	0.77	x	1.04	x	34.53	x	0.63	x	0.7	=	10.98	(74)
North	0.9x	0.77	x	2.62	x	34.53	x	0.63	x	0.7	=	55.3	(74)
North	0.9x	0.77	x	1.04	x	55.46	x	0.63	x	0.7	=	17.63	(74)
North	0.9x	0.77	x	2.62	x	55.46	x	0.63	x	0.7	=	88.82	(74)
North	0.9x	0.77	x	1.04	x	74.72	x	0.63	x	0.7	=	23.75	(74)
North	0.9x	0.77	x	2.62	x	74.72	x	0.63	x	0.7	=	119.65	(74)
North	0.9x	0.77	x	1.04	x	79.99	x	0.63	x	0.7	=	25.42	(74)
North	0.9x	0.77	x	2.62	x	79.99	x	0.63	x	0.7	=	128.09	(74)
North	0.9x	0.77	x	1.04	x	74.68	x	0.63	x	0.7	=	23.74	(74)
North	0.9x	0.77	x	2.62	x	74.68	x	0.63	x	0.7	=	119.59	(74)
North	0.9x	0.77	x	1.04	x	59.25	x	0.63	x	0.7	=	18.83	(74)
North	0.9x	0.77	x	2.62	x	59.25	x	0.63	x	0.7	=	94.88	(74)
North	0.9x	0.77	x	1.04	x	41.52	x	0.63	x	0.7	=	13.2	(74)
North	0.9x	0.77	x	2.62	x	41.52	x	0.63	x	0.7	=	66.49	(74)
North	0.9x	0.77	x	1.04	x	24.19	x	0.63	x	0.7	=	7.69	(74)
North	0.9x	0.77	x	2.62	x	24.19	x	0.63	x	0.7	=	38.74	(74)
North	0.9x	0.77	x	1.04	x	13.12	x	0.63	x	0.7	=	4.17	(74)
North	0.9x	0.77	x	2.62	x	13.12	x	0.63	x	0.7	=	21.01	(74)
North	0.9x	0.77	x	1.04	x	8.86	x	0.63	x	0.7	=	2.82	(74)
North	0.9x	0.77	x	2.62	x	8.86	x	0.63	x	0.7	=	14.2	(74)
Northeast	0.9x	0.77	x	1.92	x	11.28	x	0.63	x	0.7	=	6.62	(75)
Northeast	0.9x	0.77	x	1.92	x	22.97	x	0.63	x	0.7	=	13.48	(75)
Northeast	0.9x	0.77	x	1.92	x	41.38	x	0.63	x	0.7	=	24.28	(75)
Northeast	0.9x	0.77	x	1.92	x	67.96	x	0.63	x	0.7	=	39.87	(75)
Northeast	0.9x	0.77	x	1.92	x	91.35	x	0.63	x	0.7	=	53.6	(75)
Northeast	0.9x	0.77	x	1.92	x	97.38	x	0.63	x	0.7	=	57.14	(75)
Northeast	0.9x	0.77	x	1.92	x	91.1	x	0.63	x	0.7	=	53.46	(75)
Northeast	0.9x	0.77	x	1.92	x	72.63	x	0.63	x	0.7	=	42.62	(75)
Northeast	0.9x	0.77	x	1.92	x	50.42	x	0.63	x	0.7	=	29.59	(75)
Northeast	0.9x	0.77	x	1.92	x	28.07	x	0.63	x	0.7	=	16.47	(75)
Northeast	0.9x	0.77	x	1.92	x	14.2	x	0.63	x	0.7	=	8.33	(75)
Northeast	0.9x	0.77	x	1.92	x	9.21	x	0.63	x	0.7	=	5.41	(75)
East	0.9x	0.77	x	1.6	x	19.64	x	0.63	x	0.7	=	9.6	(76)
East	0.9x	0.77	x	3.39	x	19.64	x	0.63	x	0.7	=	20.35	(76)
East	0.9x	0.77	x	1.6	x	38.42	x	0.63	x	0.7	=	18.79	(76)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	3.39	x	38.42	x	0.63	x	0.7	=	39.8	(76)
East	0.9x	0.77	x	1.6	x	63.27	x	0.63	x	0.7	=	30.94	(76)
East	0.9x	0.77	x	3.39	x	63.27	x	0.63	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	1.6	x	92.28	x	0.63	x	0.7	=	45.12	(76)
East	0.9x	0.77	x	3.39	x	92.28	x	0.63	x	0.7	=	95.6	(76)
East	0.9x	0.77	x	1.6	x	113.09	x	0.63	x	0.7	=	55.3	(76)
East	0.9x	0.77	x	3.39	x	113.09	x	0.63	x	0.7	=	117.17	(76)
East	0.9x	0.77	x	1.6	x	115.77	x	0.63	x	0.7	=	56.61	(76)
East	0.9x	0.77	x	3.39	x	115.77	x	0.63	x	0.7	=	119.94	(76)
East	0.9x	0.77	x	1.6	x	110.22	x	0.63	x	0.7	=	53.89	(76)
East	0.9x	0.77	x	3.39	x	110.22	x	0.63	x	0.7	=	114.19	(76)
East	0.9x	0.77	x	1.6	x	94.68	x	0.63	x	0.7	=	46.29	(76)
East	0.9x	0.77	x	3.39	x	94.68	x	0.63	x	0.7	=	98.09	(76)
East	0.9x	0.77	x	1.6	x	73.59	x	0.63	x	0.7	=	35.98	(76)
East	0.9x	0.77	x	3.39	x	73.59	x	0.63	x	0.7	=	76.24	(76)
East	0.9x	0.77	x	1.6	x	45.59	x	0.63	x	0.7	=	22.29	(76)
East	0.9x	0.77	x	3.39	x	45.59	x	0.63	x	0.7	=	47.23	(76)
East	0.9x	0.77	x	1.6	x	24.49	x	0.63	x	0.7	=	11.97	(76)
East	0.9x	0.77	x	3.39	x	24.49	x	0.63	x	0.7	=	25.37	(76)
East	0.9x	0.77	x	1.6	x	16.15	x	0.63	x	0.7	=	7.9	(76)
East	0.9x	0.77	x	3.39	x	16.15	x	0.63	x	0.7	=	16.73	(76)
South	0.9x	0.77	x	1.06	x	46.75	x	0.63	x	0.7	=	15.15	(78)
South	0.9x	0.77	x	1.06	x	76.57	x	0.63	x	0.7	=	24.8	(78)
South	0.9x	0.77	x	1.06	x	97.53	x	0.63	x	0.7	=	31.6	(78)
South	0.9x	0.77	x	1.06	x	110.23	x	0.63	x	0.7	=	35.71	(78)
South	0.9x	0.77	x	1.06	x	114.87	x	0.63	x	0.7	=	37.21	(78)
South	0.9x	0.77	x	1.06	x	110.55	x	0.63	x	0.7	=	35.81	(78)
South	0.9x	0.77	x	1.06	x	108.01	x	0.63	x	0.7	=	34.99	(78)
South	0.9x	0.77	x	1.06	x	104.89	x	0.63	x	0.7	=	33.98	(78)
South	0.9x	0.77	x	1.06	x	101.89	x	0.63	x	0.7	=	33.01	(78)
South	0.9x	0.77	x	1.06	x	82.59	x	0.63	x	0.7	=	26.75	(78)
South	0.9x	0.77	x	1.06	x	55.42	x	0.63	x	0.7	=	17.95	(78)
South	0.9x	0.77	x	1.06	x	40.4	x	0.63	x	0.7	=	13.09	(78)
Northwest	0.9x	0.77	x	1.92	x	11.28	x	0.63	x	0.7	=	6.62	(81)
Northwest	0.9x	0.77	x	1.92	x	22.97	x	0.63	x	0.7	=	13.48	(81)
Northwest	0.9x	0.77	x	1.92	x	41.38	x	0.63	x	0.7	=	24.28	(81)
Northwest	0.9x	0.77	x	1.92	x	67.96	x	0.63	x	0.7	=	39.87	(81)
Northwest	0.9x	0.77	x	1.92	x	91.35	x	0.63	x	0.7	=	53.6	(81)
Northwest	0.9x	0.77	x	1.92	x	97.38	x	0.63	x	0.7	=	57.14	(81)
Northwest	0.9x	0.77	x	1.92	x	91.1	x	0.63	x	0.7	=	53.46	(81)
Northwest	0.9x	0.77	x	1.92	x	72.63	x	0.63	x	0.7	=	42.62	(81)

TER WorkSheet: New dwelling design stage

Northwest 0.9x	0.77	x	1.92	x	50.42	x	0.63	x	0.7	=	29.59	(81)
Northwest 0.9x	0.77	x	1.92	x	28.07	x	0.63	x	0.7	=	16.47	(81)
Northwest 0.9x	0.77	x	1.92	x	14.2	x	0.63	x	0.7	=	8.33	(81)
Northwest 0.9x	0.77	x	1.92	x	9.21	x	0.63	x	0.7	=	5.41	(81)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	78.75	149.35	242.92	362.64	460.28	480.16	453.31	377.3	284.08	175.64	97.14	65.54	(83)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	479.89	548.52	629.45	728.79	805.79	805.7	765.83	695.53	612.73	524.87	470.03	456.13	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.93	0.8	0.6	0.44	0.51	0.78	0.96	0.99	1	(86)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	19.9	20.05	20.31	20.65	20.89	20.98	21	20.99	20.92	20.6	20.19	19.87	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.01	20.01	20.01	20.02	20.02	20.03	20.03	20.03	20.03	20.02	20.02	20.02	(88)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	1	0.99	0.97	0.91	0.74	0.52	0.35	0.4	0.7	0.95	0.99	1	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	18.54	18.76	19.14	19.62	19.92	20.02	20.03	20.03	19.97	19.56	18.97	18.51	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	19.12	19.31	19.64	20.05	20.33	20.43	20.44	20.44	20.38	20	19.49	19.08	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	19.12	19.31	19.64	20.05	20.33	20.43	20.44	20.44	20.38	20	19.49	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=	0.99	0.99	0.97	0.91	0.76	0.55	0.39	0.45	0.73	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	477.34	542.46	611.02	661.3	611.82	443.08	296.94	310.66	449.87	496.57	464.85	454.24	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1176.99	1142.29	1039.54	874.48	675.41	452.34	298.11	313.06	488.67	735.84	972.81	1173.14	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	520.55	403.09	318.82	153.49	47.31	0	0	0	0	178.02	365.73	534.86	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 2521.87 (98)

Space heating requirement in kWh/m²/year — 34.55 (99)

TER WorkSheet: New dwelling design stage

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)													
	520.55	403.09	318.82	153.49	47.31	0	0	0	0	178.02	365.73	534.86	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	556.73	431.11	340.98	164.16	50.6	0	0	0	0	190.39	391.16	572.05	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2697.19 (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)

	194.79	171.77	180.6	162.17	159.13	142.48	137.11	150.07	149.69	168.15	177.45	190.19	

Efficiency of water heater 79.8 (216)

(217)m=	87.31	87.01	86.31	84.67	82.02	79.8	79.8	79.8	79.8	84.97	86.7	87.43	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	223.09	197.41	209.23	191.54	194	178.54	171.82	188.06	187.58	197.9	204.67	217.55	

Total = Sum(219a)$_{1...12}$ = 2361.39 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2697.19
Water heating fuel used		2361.39
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		321.54 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		5455.12 (338)

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

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	582.59	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	510.06	(264)

TER WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			1092.65	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.88	(268)
Total CO2, kg/year	sum of (265)…(271) =			1298.46	(272)

TER = 26.02 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:15

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 60.2m²

Site Reference : 43LS **Plot Reference:** FLAT 07

Address : FLAT 07, 43 London Street, Reading, RG1 4PS

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)	24.95 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.13 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.19 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	**OK**
Openings	1.07 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

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

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.76	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	2.81m²
Windows facing: South	1.1m²
Windows facing: North	5.74m²
Windows facing: North West	2.1m²
Windows facing: North East	2.1m²
Windows facing: South	1.51m²
Ventilation rate:	6.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.85 W/m²K
Roofs U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 07

Address : FLAT 07, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.2	(1a) x	2.3	(2a) =	138.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		138.46	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

DER WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

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

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			2.81	x1/[1/(1.1)+ 0.04]		=	2.96			(27)
Windows Type 2			1.1	x1/[1/(1.1)+ 0.04]		=	1.16			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 6			1.51	x1/[1/(1.1)+ 0.04]		=	1.59			(27)
Walls Type1	11.04	2.1	8.94	x	0.19	=	1.7	14	125.16	(29)
Walls Type2	61.87	15.36	46.51	x	0.16	=	7.44	14	651.14	(29)
Roof	1.2	0	1.2	x	0.12	=	0.14	9	10.8	(30)
Total area of elements, m²			74.11							(31)
Party wall			3.91	x	0	=	0	20	78.2	(32)
Party floor			60.2					30	1806	(32a)
Party ceiling			59					20	1180	(32b)
Internal wall **			124.2					9	1117.8	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 27.25 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4969.1 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 82.54 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 11.12 (36)

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

Total fabric heat loss (33) + (36) = 38.37 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	16.34	16.14	15.94	14.94	14.74	13.74	13.74	13.54	14.14	14.74	15.14	15.54	(38)

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

(39)m=	54.71	54.51	54.31	53.31	53.11	52.11	52.11	51.91	52.51	53.11	53.51	53.91	

Average = Sum(39)$_{1...12}$ /12= 53.26 (39)

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

(40)m=	0.91	0.91	0.9	0.89	0.88	0.87	0.87	0.86	0.87	0.88	0.89	0.9	

Average = Sum(40)$_{1...12}$ /12= 0.88 (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 — 1.99 (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 — 81.4 (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=	89.54	86.28	83.03	79.77	76.51	73.26	73.26	76.51	79.77	83.03	86.28	89.54	

Total = Sum(44)$_{1...12}$ = 976.78 (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=	132.78	116.13	119.84	104.48	100.25	86.51	80.16	91.99	93.08	108.48	118.42	128.59	

Total = Sum(45)$_{1...12}$ = 1280.71 (45)

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

(46)m=	19.92	17.42	17.98	15.67	15.04	12.98	12.02	13.8	13.96	16.27	17.76	19.29	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)	0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	(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=	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	

Output from water heater (annual)$_{1...12}$ 1446.27 (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=	44.15	38.61	39.85	34.74	33.33	28.76	26.65	30.59	30.95	36.07	39.37	42.76	(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=	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	(66)

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

(67)m=	15.46	13.73	11.17	8.46	6.32	5.34	5.77	7.5	10.06	12.77	14.91	15.89	(67)

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

(68)m=	173.45	175.25	170.72	161.06	148.87	137.41	129.76	127.96	132.5	142.15	154.34	165.8	(68)

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

(69)m=	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	(70)

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

(71)m=	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	(71)

Water heating gains (Table 5)

(72)m=	59.34	57.46	53.56	48.25	44.8	39.95	35.82	41.11	42.99	48.48	54.69	57.47	(72)

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

(73)m=	309.37	307.56	296.56	278.88	261.11	243.82	232.47	237.68	246.66	264.53	285.05	300.28	(73)

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.87	x	10.63	x	0.63	x	0.7	=	18.65	(74)
North	0.9x	0.77	x	2.87	x	20.32	x	0.63	x	0.7	=	35.65	(74)
North	0.9x	0.77	x	2.87	x	34.53	x	0.63	x	0.7	=	60.57	(74)
North	0.9x	0.77	x	2.87	x	55.46	x	0.63	x	0.7	=	97.3	(74)
North	0.9x	0.77	x	2.87	x	74.72	x	0.63	x	0.7	=	131.07	(74)
North	0.9x	0.77	x	2.87	x	79.99	x	0.63	x	0.7	=	140.31	(74)
North	0.9x	0.77	x	2.87	x	74.68	x	0.63	x	0.7	=	131	(74)
North	0.9x	0.77	x	2.87	x	59.25	x	0.63	x	0.7	=	103.93	(74)
North	0.9x	0.77	x	2.87	x	41.52	x	0.63	x	0.7	=	72.83	(74)
North	0.9x	0.77	x	2.87	x	24.19	x	0.63	x	0.7	=	42.43	(74)
North	0.9x	0.77	x	2.87	x	13.12	x	0.63	x	0.7	=	23.01	(74)
North	0.9x	0.77	x	2.87	x	8.86	x	0.63	x	0.7	=	15.55	(74)
Northeast	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(75)
Northeast	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(75)
Northeast	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(75)
Northeast	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(75)
Northeast	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(75)
Northeast	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(75)
Northeast	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(75)
Northeast	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(75)
Northeast	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(75)
Northeast	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(75)
Northeast	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(75)
Northeast	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(75)
South	0.9x	0.77	x	1.1	x	46.75	x	0.63	x	0.7	=	15.72	(78)
South	0.9x	0.77	x	1.51	x	46.75	x	0.63	x	0.7	=	21.57	(78)
South	0.9x	0.77	x	1.1	x	76.57	x	0.63	x	0.7	=	25.74	(78)
South	0.9x	0.77	x	1.51	x	76.57	x	0.63	x	0.7	=	35.33	(78)
South	0.9x	0.77	x	1.1	x	97.53	x	0.63	x	0.7	=	32.79	(78)
South	0.9x	0.77	x	1.51	x	97.53	x	0.63	x	0.7	=	45.01	(78)
South	0.9x	0.77	x	1.1	x	110.23	x	0.63	x	0.7	=	37.06	(78)
South	0.9x	0.77	x	1.51	x	110.23	x	0.63	x	0.7	=	50.87	(78)
South	0.9x	0.77	x	1.1	x	114.87	x	0.63	x	0.7	=	38.62	(78)
South	0.9x	0.77	x	1.51	x	114.87	x	0.63	x	0.7	=	53.01	(78)
South	0.9x	0.77	x	1.1	x	110.55	x	0.63	x	0.7	=	37.16	(78)
South	0.9x	0.77	x	1.51	x	110.55	x	0.63	x	0.7	=	51.02	(78)
South	0.9x	0.77	x	1.1	x	108.01	x	0.63	x	0.7	=	36.31	(78)
South	0.9x	0.77	x	1.51	x	108.01	x	0.63	x	0.7	=	49.84	(78)
South	0.9x	0.77	x	1.1	x	104.89	x	0.63	x	0.7	=	35.26	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.51	x	104.89	x	0.63	x	0.7	=	48.41	(78)
South	0.9x	0.77	x	1.1	x	101.89	x	0.63	x	0.7	=	34.25	(78)
South	0.9x	0.77	x	1.51	x	101.89	x	0.63	x	0.7	=	47.02	(78)
South	0.9x	0.77	x	1.1	x	82.59	x	0.63	x	0.7	=	27.76	(78)
South	0.9x	0.77	x	1.51	x	82.59	x	0.63	x	0.7	=	38.11	(78)
South	0.9x	0.77	x	1.1	x	55.42	x	0.63	x	0.7	=	18.63	(78)
South	0.9x	0.77	x	1.51	x	55.42	x	0.63	x	0.7	=	25.57	(78)
South	0.9x	0.77	x	1.1	x	40.4	x	0.63	x	0.7	=	13.58	(78)
South	0.9x	0.77	x	1.51	x	40.4	x	0.63	x	0.7	=	18.64	(78)
West	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)
West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)
Northwest	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(81)
Northwest	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(81)
Northwest	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(81)
Northwest	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(81)
Northwest	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(81)
Northwest	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(81)
Northwest	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(81)
Northwest	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(81)
Northwest	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(81)
Northwest	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(81)
Northwest	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(81)
Northwest	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(81)

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

(83)m=	87.29	159.2	245.82	351.7	437.06	452.91	428.74	362.13	282.01	183.49	106.47	73.47	(83)

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

(84)m=	396.67	466.76	542.38	630.58	698.18	696.73	661.21	599.81	528.67	448.01	391.52	373.75	(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

DER WorkSheet: New dwelling design stage

(86)m=	0.94	0.9	0.85	0.74	0.6	0.44	0.33	0.38	0.58	0.8	0.91	0.94	(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=	20.55	20.55	20.55	20.56	20.56	20.57	20.57	20.57	20.56	20.56	20.56	20.55	(88)

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

(89)m=	0.93	0.9	0.84	0.73	0.58	0.42	0.3	0.35	0.56	0.79	0.9	0.94	(89)

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

(90)m=	20.55	20.55	20.55	20.56	20.56	20.57	20.57	20.57	20.56	20.56	20.56	20.55	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

(92)m=	20.74	20.74	20.74	20.74	20.75	20.75	20.75	20.75	20.75	20.75	20.74	20.74	(92)

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

(93)m=	20.74	20.74	20.74	20.74	20.75	20.75	20.75	20.75	20.75	20.75	20.74	20.74	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.93	0.9	0.84	0.73	0.59	0.43	0.32	0.36	0.57	0.8	0.91	0.94	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	370.71	420.98	457.11	461.67	408.7	299.16	209.57	216.26	301.18	356.43	354.53	352.27	(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=	899.33	863.39	773.38	631.45	480.43	320.51	216.29	225.89	349.13	538.85	730.09	891.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	393.29	297.3	235.3	122.25	53.36	0	0	0	0	135.72	270.4	401.4	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1909.02 (98)

Space heating requirement in kWh/m²/year 31.71 (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 1 505.48 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	393.29	297.3	235.3	122.25	53.36	0	0	0	0	135.72	270.4	401.4	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	77.81	58.82	46.55	24.18	10.56	0	0	0	0	26.85	53.49	79.41	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 377.67 (211)

DER WorkSheet: New dwelling design stage

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)

	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

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

(219)m=	75.62	66.35	68.96	60.81	58.87	51.56	48.52	54.61	54.95	63.11	67.99	73.46

Total = Sum(219a)$_{1...12}$ = 744.81 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		377.67	
Water heating fuel used		744.81	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	160.48		(230a)
warm air heating system fans	83.08		(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	243.55	(231)
Electricity for lighting		273.09	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1639.12	(338)

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

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519 =	196.01	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.519 =	386.56	(264)
Space and water heating	(261) + (262) + (263) + (264) =		582.57	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	126.4	(267)
Electricity for lighting	(232) x	0.519 =	141.73	(268)
Total CO2, kg/year	sum of (265)…(271) =		850.7	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =		14.13	(273)
EI rating (section 14)			89	(274)

Predicted Energy Assessment

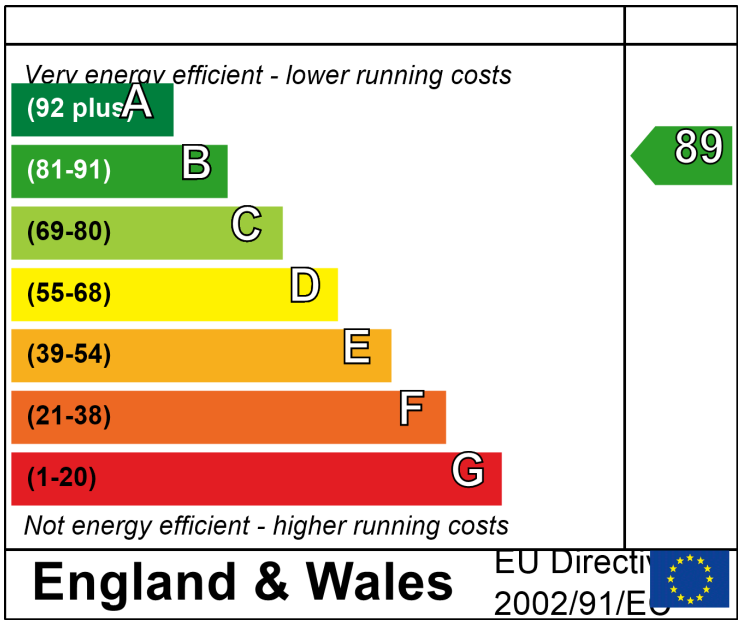
FLAT 07
43 London Street
Reading
RG1 4PS

Dwelling type:	Mid floor Flat
Date of assessment:	23 June 2025
Produced by:	Ondrej Gajdos
Total floor area:	60.2 m²

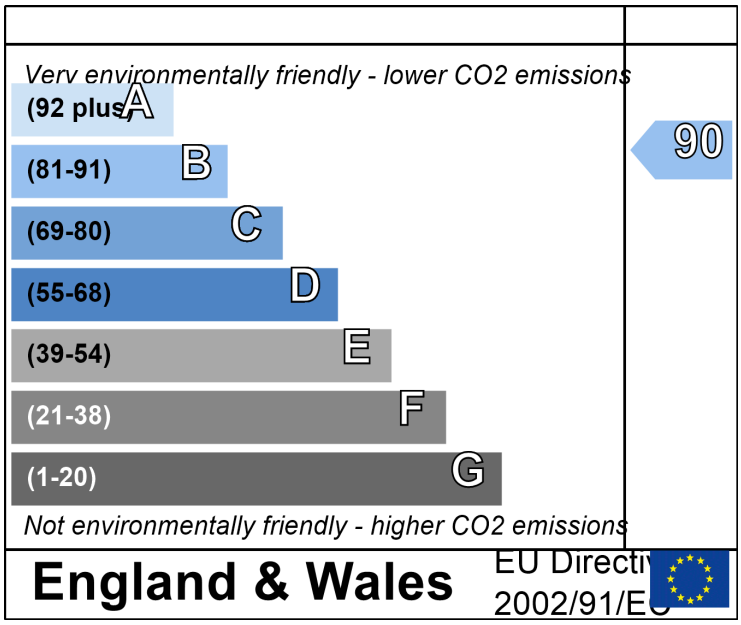
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 07

Address : FLAT 07, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.2	(1a) x	2.3	(2a) =	138.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		138.46	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

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

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			2.81	x1/[1/(1.1)+ 0.04]		=	2.96			(27)
Windows Type 2			1.1	x1/[1/(1.1)+ 0.04]		=	1.16			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 6			1.51	x1/[1/(1.1)+ 0.04]		=	1.59			(27)
Walls Type1	11.04	2.1	8.94	x	0.19	=	1.7	14	125.16	(29)
Walls Type2	61.87	15.36	46.51	x	0.16	=	7.44	14	651.14	(29)
Roof	1.2	0	1.2	x	0.12	=	0.14	9	10.8	(30)
Total area of elements, m²			74.11							(31)
Party wall			3.91	x	0	=	0	20	78.2	(32)
Party floor			60.2					30	1806	(32a)
Party ceiling			59					20	1180	(32b)
Internal wall **			124.2					9	1117.8	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 27.25 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4969.1 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 82.54 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 11.12 (36)

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

Total fabric heat loss (33) + (36) = 38.37 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	16.34	16.14	15.94	14.94	14.74	13.74	13.74	13.54	14.14	14.74	15.14	15.54	(38)

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

(39)m=	54.71	54.51	54.31	53.31	53.11	52.11	52.11	51.91	52.51	53.11	53.51	53.91	

Average = Sum(39)$_{1...12}$ /12= 53.26 (39)

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

(40)m=	0.91	0.91	0.9	0.89	0.88	0.87	0.87	0.86	0.87	0.88	0.89	0.9	

Average = Sum(40)$_{1...12}$ /12= 0.88 (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 — 1.99 (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 — 81.4 (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=	89.54	86.28	83.03	79.77	76.51	73.26	73.26	76.51	79.77	83.03	86.28	89.54	

Total = Sum(44)$_{1...12}$ = 976.78 (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=	132.78	116.13	119.84	104.48	100.25	86.51	80.16	91.99	93.08	108.48	118.42	128.59	

Total = Sum(45)$_{1...12}$ = 1280.71 (45)

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

(46)m=	19.92	17.42	17.98	15.67	15.04	12.98	12.02	13.8	13.96	16.27	17.76	19.29	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	(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=	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65	

Output from water heater (annual)$_{1...12}$ 1446.27 (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=	44.15	38.61	39.85	34.74	33.33	28.76	26.65	30.59	30.95	36.07	39.37	42.76	(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=	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	119.24	(66)

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

(67)m=	38.66	34.34	27.92	21.14	15.8	13.34	14.42	18.74	25.15	31.93	37.27	39.73	(67)

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

(68)m=	258.88	261.57	254.8	240.39	222.2	205.1	193.67	190.99	197.76	212.17	230.36	247.46	(68)

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

(69)m=	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	48.91	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	(70)

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

(71)m=	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	(71)

Water heating gains (Table 5)

(72)m=	59.34	57.46	53.56	48.25	44.8	39.95	35.82	41.11	42.99	48.48	54.69	57.47	(72)

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

(73)m=	453.85	450.33	433.24	406.74	379.76	355.35	340.88	347.8	362.86	389.55	419.28	441.63	(73)

6. Solar gains:

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

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 1	x	2.87	x	10.63	x	0.63	x	0.7	=	24.23	(74)
North	0.9x 1	x	2.87	x	20.32	x	0.63	x	0.7	=	46.3	(74)
North	0.9x 1	x	2.87	x	34.53	x	0.63	x	0.7	=	78.67	(74)
North	0.9x 1	x	2.87	x	55.46	x	0.63	x	0.7	=	126.36	(74)
North	0.9x 1	x	2.87	x	74.72	x	0.63	x	0.7	=	170.22	(74)
North	0.9x 1	x	2.87	x	79.99	x	0.63	x	0.7	=	182.22	(74)
North	0.9x 1	x	2.87	x	74.68	x	0.63	x	0.7	=	170.13	(74)
North	0.9x 1	x	2.87	x	59.25	x	0.63	x	0.7	=	134.98	(74)
North	0.9x 1	x	2.87	x	41.52	x	0.63	x	0.7	=	94.58	(74)
North	0.9x 1	x	2.87	x	24.19	x	0.63	x	0.7	=	55.11	(74)
North	0.9x 1	x	2.87	x	13.12	x	0.63	x	0.7	=	29.88	(74)
North	0.9x 1	x	2.87	x	8.86	x	0.63	x	0.7	=	20.2	(74)
Northeast	0.9x 1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4	(75)
Northeast	0.9x 1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14	(75)
Northeast	0.9x 1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49	(75)
Northeast	0.9x 1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64	(75)
Northeast	0.9x 1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14	(75)
Northeast	0.9x 1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17	(75)
Northeast	0.9x 1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93	(75)
Northeast	0.9x 1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53	(75)
Northeast	0.9x 1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03	(75)
Northeast	0.9x 1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39	(75)
Northeast	0.9x 1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(75)
Northeast	0.9x 1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(75)
South	0.9x 1	x	1.1	x	46.75	x	0.63	x	0.7	=	20.41	(78)
South	0.9x 1	x	1.51	x	46.75	x	0.63	x	0.7	=	28.02	(78)
South	0.9x 1	x	1.1	x	76.57	x	0.63	x	0.7	=	33.43	(78)
South	0.9x 1	x	1.51	x	76.57	x	0.63	x	0.7	=	45.89	(78)
South	0.9x 1	x	1.1	x	97.53	x	0.63	x	0.7	=	42.58	(78)
South	0.9x 1	x	1.51	x	97.53	x	0.63	x	0.7	=	58.45	(78)
South	0.9x 1	x	1.1	x	110.23	x	0.63	x	0.7	=	48.13	(78)
South	0.9x 1	x	1.51	x	110.23	x	0.63	x	0.7	=	66.07	(78)
South	0.9x 1	x	1.1	x	114.87	x	0.63	x	0.7	=	50.15	(78)
South	0.9x 1	x	1.51	x	114.87	x	0.63	x	0.7	=	68.84	(78)
South	0.9x 1	x	1.1	x	110.55	x	0.63	x	0.7	=	48.26	(78)
South	0.9x 1	x	1.51	x	110.55	x	0.63	x	0.7	=	66.25	(78)
South	0.9x 1	x	1.1	x	108.01	x	0.63	x	0.7	=	47.16	(78)
South	0.9x 1	x	1.51	x	108.01	x	0.63	x	0.7	=	64.73	(78)
South	0.9x 1	x	1.1	x	104.89	x	0.63	x	0.7	=	45.8	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	1	x	1.51	x	104.89	x	0.63	x	0.7	=	62.87	(78)
South	0.9x	1	x	1.1	x	101.89	x	0.63	x	0.7	=	44.48	(78)
South	0.9x	1	x	1.51	x	101.89	x	0.63	x	0.7	=	61.06	(78)
South	0.9x	1	x	1.1	x	82.59	x	0.63	x	0.7	=	36.06	(78)
South	0.9x	1	x	1.51	x	82.59	x	0.63	x	0.7	=	49.5	(78)
South	0.9x	1	x	1.1	x	55.42	x	0.63	x	0.7	=	24.19	(78)
South	0.9x	1	x	1.51	x	55.42	x	0.63	x	0.7	=	33.21	(78)
South	0.9x	1	x	1.1	x	40.4	x	0.63	x	0.7	=	17.64	(78)
South	0.9x	1	x	1.51	x	40.4	x	0.63	x	0.7	=	24.21	(78)
West	0.9x	1	x	2.81	x	19.64	x	0.63	x	0.7	=	21.9	(80)
West	0.9x	1	x	2.81	x	38.42	x	0.63	x	0.7	=	42.85	(80)
West	0.9x	1	x	2.81	x	63.27	x	0.63	x	0.7	=	70.57	(80)
West	0.9x	1	x	2.81	x	92.28	x	0.63	x	0.7	=	102.92	(80)
West	0.9x	1	x	2.81	x	113.09	x	0.63	x	0.7	=	126.13	(80)
West	0.9x	1	x	2.81	x	115.77	x	0.63	x	0.7	=	129.12	(80)
West	0.9x	1	x	2.81	x	110.22	x	0.63	x	0.7	=	122.93	(80)
West	0.9x	1	x	2.81	x	94.68	x	0.63	x	0.7	=	105.59	(80)
West	0.9x	1	x	2.81	x	73.59	x	0.63	x	0.7	=	82.07	(80)
West	0.9x	1	x	2.81	x	45.59	x	0.63	x	0.7	=	50.85	(80)
West	0.9x	1	x	2.81	x	24.49	x	0.63	x	0.7	=	27.31	(80)
West	0.9x	1	x	2.81	x	16.15	x	0.63	x	0.7	=	18.01	(80)
Northwest	0.9x	1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4	(81)
Northwest	0.9x	1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14	(81)
Northwest	0.9x	1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49	(81)
Northwest	0.9x	1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64	(81)
Northwest	0.9x	1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14	(81)
Northwest	0.9x	1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17	(81)
Northwest	0.9x	1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93	(81)
Northwest	0.9x	1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53	(81)
Northwest	0.9x	1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03	(81)
Northwest	0.9x	1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39	(81)
Northwest	0.9x	1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(81)
Northwest	0.9x	1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(81)

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

(83)m=	113.37	206.75	319.25	456.75	567.62	588.2	556.81	470.3	366.25	238.29	138.27	95.42	(83)

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

(84)m=	567.21	657.08	752.49	863.49	947.38	943.55	897.69	818.09	729.11	627.84	557.55	537.04	(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

SAP WorkSheet: New dwelling design stage

(86)m=	0.87	0.82	0.75	0.62	0.48	0.34	0.25	0.29	0.46	0.68	0.83	0.88	(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=	20.55	20.55	20.55	20.56	20.56	20.57	20.57	20.57	20.56	20.56	20.56	20.55	(88)

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

(89)m=	0.87	0.82	0.73	0.6	0.46	0.32	0.23	0.26	0.43	0.67	0.82	0.88	(89)

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

(90)m=	20.55	20.55	20.55	20.56	20.56	20.57	20.57	20.57	20.56	20.56	20.56	20.55	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

(92)m=	20.74	20.74	20.74	20.74	20.75	20.75	20.75	20.75	20.75	20.75	20.74	20.74	(92)

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

(93)m=	20.74	20.74	20.74	20.74	20.75	20.75	20.75	20.75	20.75	20.75	20.74	20.74	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.87	0.82	0.74	0.61	0.46	0.33	0.24	0.27	0.44	0.67	0.82	0.88	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	492.71	538.35	556.26	526.44	440.21	309.64	213.07	221.24	323.54	423.16	457.59	473.16	(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=	899.33	863.39	773.38	631.45	480.43	320.51	216.29	225.89	349.13	538.85	730.09	891.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	302.52	218.43	161.54	75.61	29.92	0	0	0	0	86.08	196.2	311.45	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1381.75 (98)

Space heating requirement in kWh/m²/year 22.95 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 505.48 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	302.52	218.43	161.54	75.61	29.92	0	0	0	0	86.08	196.2	311.45	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	59.85	43.21	31.96	14.96	5.92	0	0	0	0	17.03	38.81	61.62	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 273.36 (211)

SAP WorkSheet: New dwelling design stage

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)

	146.84	128.83	133.9	118.09	114.31	100.11	94.22	106.05	106.69	122.54	132.02	142.65

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

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

(219)m=	75.62	66.35	68.96	60.81	58.87	51.56	48.52	54.61	54.95	63.11	67.99	73.46

Total = Sum(219a)$_{1...12}$ = 744.81 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		273.36
Water heating fuel used		744.81
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	160.48	(230a)
warm air heating system fans	83.08	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		243.55 (231)
Electricity for lighting		273.09 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1534.8 (338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year
Space heating - main system 1	(211) x	13.19 x 0.01 =	36.06 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	13.19 x 0.01 =	98.24 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	32.12 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a			
Energy for lighting	(232)	13.19 x 0.01 =	36.02 (250)
Additional standing charges (Table 12)			0 (251)
Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost (245)...(247) + (250)…(254) =			202.44 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42 (256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.81 (257)
SAP rating (Section 12)		88.73 (258)

SAP WorkSheet: New dwelling design stage

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	=	141.87	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	386.56	(264)
Space and water heating	(261) + (262) + (263) + (264) =			528.43	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	126.4	(267)
Electricity for lighting	(232) x	0.519	=	141.73	(268)
Total CO2, kg/year	sum of (265)…(271) =			796.56	(272)
CO2 emissions per m²	(272) ÷ (4) =			13.23	(273)
EI rating (section 14)				90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	839.21	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2286.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3125.77	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	747.7	(267)
Electricity for lighting	(232) x	0	=	838.38	(268)
‘Total Primary Energy	sum of (265)…(271) =			4711.85	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			78.27	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 07

Address : FLAT 07, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.2 (1a)	x	2.3 (2a)	=	138.46	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	138.46	(5)

2. Ventilation rate:

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.14	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

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

TER WorkSheet: New dwelling design stage

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

0.35	0.35	0.34	0.3	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.32

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=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(24d)

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

(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			2.37	x1/[1/(1.4)+ 0.04]		=	3.14			(27)
Windows Type 2			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 3			2.42	x1/[1/(1.4)+ 0.04]		=	3.21			(27)
Windows Type 4			1.77	x1/[1/(1.4)+ 0.04]		=	2.35			(27)
Windows Type 5			1.77	x1/[1/(1.4)+ 0.04]		=	2.35			(27)
Windows Type 6			1.27	x1/[1/(1.4)+ 0.04]		=	1.68			(27)
Walls Type1	11.04	2.1	8.94	x	0.18	=	1.61			(29)
Walls Type2	61.87	12.95	48.92	x	0.18	=	8.81			(29)
Roof	1.2	0	1.2	x	0.13	=	0.16			(30)
Total area of elements, m²			74.11							(31)
Party wall			3.91	x	0	=	0			(32)
Party floor			60.2							(32a)
Party ceiling			59							(32b)
Internal wall **			124.2							(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.84 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5002.84 (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

TER WorkSheet: New dwelling design stage

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 3.71 (36)

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

Total fabric heat loss (33) + (36) = — 33.54 (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=	25.68	25.57	25.46	24.95	24.86	24.42	24.42	24.34	24.59	24.86	25.05	25.25	(38)

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

(39)m=	59.22	59.11	59	58.5	58.4	57.96	57.96	57.88	58.13	58.4	58.6	58.8	

Average = Sum(39)$_{1...12}$ /12= 58.5 (39)

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

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

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

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 1.99 (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 — 81.4 (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=	89.54	86.28	83.03	79.77	76.51	73.26	73.26	76.51	79.77	83.03	86.28	89.54	

Total = Sum(44)$_{1...12}$ = 976.78 (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=	132.78	116.13	119.84	104.48	100.25	86.51	80.16	91.99	93.08	108.48	118.42	128.59	

Total = Sum(45)$_{1...12}$ = 1280.71 (45)

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

(46)m=	19.92	17.42	17.98	15.67	15.04	12.98	12.02	13.8	13.96	16.27	17.76	19.29	(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): — 1.55 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0.84 (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)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0 (54)
Enter (50) or (54) in (55)		0.84 (55)

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

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	182.02	160.61	169.08	152.13	149.49	134.16	129.4	141.23	140.74	157.72	166.07	177.83	(62)

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

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

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

Output from water heater

(64)m=	182.02	160.61	169.08	152.13	149.49	134.16	129.4	141.23	140.74	157.72	166.07	177.83	

Output from water heater (annual)$_{1...12}$: 1860.5 (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=	83.54	74.2	79.24	72.86	72.73	66.89	66.05	69.98	69.07	75.46	77.5	82.15	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	99.36	(66)

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

(67)m=	15.48	13.75	11.18	8.47	6.33	5.34	5.77	7.5	10.07	12.79	14.93	15.91	(67)

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

(68)m=	173.45	175.25	170.72	161.06	148.87	137.41	129.76	127.96	132.5	142.15	154.34	165.8	(68)

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

(69)m=	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	32.94	(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=	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	-79.49	(71)

Water heating gains (Table 5)

(72)m=	112.29	110.41	106.51	101.2	97.75	92.9	88.77	94.06	95.94	101.43	107.63	110.42	(72)

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

(73)m=	357.03	355.22	344.21	326.53	308.76	291.47	280.12	285.33	294.32	312.18	332.71	347.94	(73)

6. Solar gains:

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

TER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9x	0.77	x	2.42	x	10.63	x	0.63	x	0.7	=	15.73	(74)
North 0.9x	0.77	x	2.42	x	20.32	x	0.63	x	0.7	=	30.06	(74)
North 0.9x	0.77	x	2.42	x	34.53	x	0.63	x	0.7	=	51.08	(74)
North 0.9x	0.77	x	2.42	x	55.46	x	0.63	x	0.7	=	82.04	(74)
North 0.9x	0.77	x	2.42	x	74.72	x	0.63	x	0.7	=	110.52	(74)
North 0.9x	0.77	x	2.42	x	79.99	x	0.63	x	0.7	=	118.31	(74)
North 0.9x	0.77	x	2.42	x	74.68	x	0.63	x	0.7	=	110.46	(74)
North 0.9x	0.77	x	2.42	x	59.25	x	0.63	x	0.7	=	87.64	(74)
North 0.9x	0.77	x	2.42	x	41.52	x	0.63	x	0.7	=	61.41	(74)
North 0.9x	0.77	x	2.42	x	24.19	x	0.63	x	0.7	=	35.78	(74)
North 0.9x	0.77	x	2.42	x	13.12	x	0.63	x	0.7	=	19.4	(74)
North 0.9x	0.77	x	2.42	x	8.86	x	0.63	x	0.7	=	13.11	(74)
Northeast 0.9x	0.77	x	1.77	x	11.28	x	0.63	x	0.7	=	6.1	(75)
Northeast 0.9x	0.77	x	1.77	x	22.97	x	0.63	x	0.7	=	12.42	(75)
Northeast 0.9x	0.77	x	1.77	x	41.38	x	0.63	x	0.7	=	22.38	(75)
Northeast 0.9x	0.77	x	1.77	x	67.96	x	0.63	x	0.7	=	36.76	(75)
Northeast 0.9x	0.77	x	1.77	x	91.35	x	0.63	x	0.7	=	49.41	(75)
Northeast 0.9x	0.77	x	1.77	x	97.38	x	0.63	x	0.7	=	52.68	(75)
Northeast 0.9x	0.77	x	1.77	x	91.1	x	0.63	x	0.7	=	49.28	(75)
Northeast 0.9x	0.77	x	1.77	x	72.63	x	0.63	x	0.7	=	39.29	(75)
Northeast 0.9x	0.77	x	1.77	x	50.42	x	0.63	x	0.7	=	27.27	(75)
Northeast 0.9x	0.77	x	1.77	x	28.07	x	0.63	x	0.7	=	15.18	(75)
Northeast 0.9x	0.77	x	1.77	x	14.2	x	0.63	x	0.7	=	7.68	(75)
Northeast 0.9x	0.77	x	1.77	x	9.21	x	0.63	x	0.7	=	4.98	(75)
South 0.9x	0.77	x	0.93	x	46.75	x	0.63	x	0.7	=	13.29	(78)
South 0.9x	0.77	x	1.27	x	46.75	x	0.63	x	0.7	=	18.15	(78)
South 0.9x	0.77	x	0.93	x	76.57	x	0.63	x	0.7	=	21.76	(78)
South 0.9x	0.77	x	1.27	x	76.57	x	0.63	x	0.7	=	29.72	(78)
South 0.9x	0.77	x	0.93	x	97.53	x	0.63	x	0.7	=	27.72	(78)
South 0.9x	0.77	x	1.27	x	97.53	x	0.63	x	0.7	=	37.86	(78)
South 0.9x	0.77	x	0.93	x	110.23	x	0.63	x	0.7	=	31.33	(78)
South 0.9x	0.77	x	1.27	x	110.23	x	0.63	x	0.7	=	42.79	(78)
South 0.9x	0.77	x	0.93	x	114.87	x	0.63	x	0.7	=	32.65	(78)
South 0.9x	0.77	x	1.27	x	114.87	x	0.63	x	0.7	=	44.58	(78)
South 0.9x	0.77	x	0.93	x	110.55	x	0.63	x	0.7	=	31.42	(78)
South 0.9x	0.77	x	1.27	x	110.55	x	0.63	x	0.7	=	42.91	(78)
South 0.9x	0.77	x	0.93	x	108.01	x	0.63	x	0.7	=	30.7	(78)
South 0.9x	0.77	x	1.27	x	108.01	x	0.63	x	0.7	=	41.92	(78)
South 0.9x	0.77	x	0.93	x	104.89	x	0.63	x	0.7	=	29.81	(78)

TER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.27	x	104.89	x	0.63	x	0.7	=	40.71	(78)
South	0.9x	0.77	x	0.93	x	101.89	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	1.27	x	101.89	x	0.63	x	0.7	=	39.54	(78)
South	0.9x	0.77	x	0.93	x	82.59	x	0.63	x	0.7	=	23.47	(78)
South	0.9x	0.77	x	1.27	x	82.59	x	0.63	x	0.7	=	32.05	(78)
South	0.9x	0.77	x	0.93	x	55.42	x	0.63	x	0.7	=	15.75	(78)
South	0.9x	0.77	x	1.27	x	55.42	x	0.63	x	0.7	=	21.51	(78)
South	0.9x	0.77	x	0.93	x	40.4	x	0.63	x	0.7	=	11.48	(78)
South	0.9x	0.77	x	1.27	x	40.4	x	0.63	x	0.7	=	15.68	(78)
West	0.9x	0.77	x	2.37	x	19.64	x	0.63	x	0.7	=	14.23	(80)
West	0.9x	0.77	x	2.37	x	38.42	x	0.63	x	0.7	=	27.83	(80)
West	0.9x	0.77	x	2.37	x	63.27	x	0.63	x	0.7	=	45.83	(80)
West	0.9x	0.77	x	2.37	x	92.28	x	0.63	x	0.7	=	66.84	(80)
West	0.9x	0.77	x	2.37	x	113.09	x	0.63	x	0.7	=	81.91	(80)
West	0.9x	0.77	x	2.37	x	115.77	x	0.63	x	0.7	=	83.85	(80)
West	0.9x	0.77	x	2.37	x	110.22	x	0.63	x	0.7	=	79.83	(80)
West	0.9x	0.77	x	2.37	x	94.68	x	0.63	x	0.7	=	68.57	(80)
West	0.9x	0.77	x	2.37	x	73.59	x	0.63	x	0.7	=	53.3	(80)
West	0.9x	0.77	x	2.37	x	45.59	x	0.63	x	0.7	=	33.02	(80)
West	0.9x	0.77	x	2.37	x	24.49	x	0.63	x	0.7	=	17.74	(80)
West	0.9x	0.77	x	2.37	x	16.15	x	0.63	x	0.7	=	11.7	(80)
Northwest	0.9x	0.77	x	1.77	x	11.28	x	0.63	x	0.7	=	6.1	(81)
Northwest	0.9x	0.77	x	1.77	x	22.97	x	0.63	x	0.7	=	12.42	(81)
Northwest	0.9x	0.77	x	1.77	x	41.38	x	0.63	x	0.7	=	22.38	(81)
Northwest	0.9x	0.77	x	1.77	x	67.96	x	0.63	x	0.7	=	36.76	(81)
Northwest	0.9x	0.77	x	1.77	x	91.35	x	0.63	x	0.7	=	49.41	(81)
Northwest	0.9x	0.77	x	1.77	x	97.38	x	0.63	x	0.7	=	52.68	(81)
Northwest	0.9x	0.77	x	1.77	x	91.1	x	0.63	x	0.7	=	49.28	(81)
Northwest	0.9x	0.77	x	1.77	x	72.63	x	0.63	x	0.7	=	39.29	(81)
Northwest	0.9x	0.77	x	1.77	x	50.42	x	0.63	x	0.7	=	27.27	(81)
Northwest	0.9x	0.77	x	1.77	x	28.07	x	0.63	x	0.7	=	15.18	(81)
Northwest	0.9x	0.77	x	1.77	x	14.2	x	0.63	x	0.7	=	7.68	(81)
Northwest	0.9x	0.77	x	1.77	x	9.21	x	0.63	x	0.7	=	4.98	(81)

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

(83)m=	73.59	134.21	207.25	296.52	368.49	381.85	361.47	305.31	237.76	154.69	89.76	61.94

(83)

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

(84)m=	430.63	489.44	551.46	623.05	677.25	673.31	641.59	590.64	532.08	466.87	422.47	409.88

(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

TER WorkSheet: New dwelling design stage

(86)m=	1	0.99	0.97	0.9	0.74	0.54	0.4	0.45	0.71	0.94	0.99	1	(86)

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

(87)m=	20.1	20.25	20.48	20.76	20.94	20.99	21	21	20.96	20.73	20.36	20.07	(87)

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

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

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

(89)m=	0.99	0.99	0.96	0.87	0.69	0.47	0.32	0.36	0.64	0.92	0.98	1	(89)

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

(90)m=	18.9	19.12	19.46	19.84	20.05	20.11	20.11	20.11	20.09	19.81	19.29	18.86	(90)

fLA = Living area ÷ (4) = 0.42 (91)

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

(92)m=	19.41	19.6	19.89	20.23	20.43	20.48	20.49	20.49	20.46	20.2	19.74	19.37	(92)

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

(93)m=	19.41	19.6	19.89	20.23	20.43	20.48	20.49	20.49	20.46	20.2	19.74	19.37	(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	0.4	0.67	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	427.16	481.21	528.12	546.58	481.07	337.72	225.07	235.96	354.67	428.61	415.15	407.31	(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=	894.72	868.73	790.16	662.96	509.69	340.99	225.41	236.66	369.58	560.46	740.8	891.96	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	347.87	260.41	194.96	83.79	21.3	0	0	0	0	98.09	234.47	360.58	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1601.46 (98)

Space heating requirement in kWh/m²/year 26.6 (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)													
	347.87	260.41	194.96	83.79	21.3	0	0	0	0	98.09	234.47	360.58	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	372.05	278.52	208.51	89.62	22.78	0	0	0	0	104.91	250.77	385.64	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1712.79 (211)

TER WorkSheet: New dwelling design stage

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)

	182.02	160.61	169.08	152.13	149.49	134.16	129.4	141.23	140.74	157.72	166.07	177.83

Efficiency of water heater 79.8 (216)

(217)m=	86.52	86.1	85.19	83.3	80.99	79.8	79.8	79.8	79.8	83.59	85.73	86.66

(217)

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

(219)m=	210.4	186.55	198.46	182.64	184.57	168.12	162.16	176.98	176.36	188.69	193.7	205.21

Total = Sum(219a)$_{1...12}$ = 2233.84 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		1712.79	
Water heating fuel used		2233.84	
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		273.44	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4295.07	(338)

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

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	369.96	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	482.51	(264)
Space and water heating	(261) + (262) + (263) + (264) =				852.47	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	141.91	(268)
Total CO2, kg/year		sum of (265)…(271) =			1033.31	(272)

TER = 24.95 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:12

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 75.1m²

Site Reference : 43LS **Plot Reference:** FLAT 08

Address : FLAT 08, 43 London Street, Reading, RG1 4PS

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)	22.11 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.68 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	36.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	35.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.19 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	**OK**
Openings	1.03 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

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

3 Air permeability

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

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.76	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: East	2.87m²
Windows facing: North	1.71m²
Windows facing: North	5.74m²
Windows facing: North West	2.1m²
Windows facing: North East	2.1m²
Windows facing: South	1.73m²
Windows facing: East	5.54m²
Windows facing: South	1.51m²
Ventilation rate:	4.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.85 W/m²K
Roofs U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 08

Address : FLAT 08, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	75.1 (1a)	x	2.3 (2a)	=	172.73	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	75.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	172.73	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

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

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 2			1.71	x1/[1/(1.1)+ 0.04]		=	1.8			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 6			1.73	x1/[1/(0.92)+ 0.04]		=	1.54			(27)
Windows Type 7			5.54	x1/[1/(0.92)+ 0.04]		=	4.92			(27)
Windows Type 8			1.51	x1/[1/(1.1)+ 0.04]		=	1.59			(27)
Walls Type1	16.79	2.1	14.69	x	0.19	=	2.79	14	205.66	(29)
Walls Type2	50.14	23.3	26.84	x	0.16	=	4.29	14	375.76	(29)
Roof	1.2	0	1.2	x	0.12	=	0.14	9	10.8	(30)
Total area of elements, m²			68.13							(31)
Party wall			27.37	x	0	=	0	20	547.4	(32)
Party floor			75.1					30	2253	(32a)
Party ceiling			73.9					20	1478	(32b)
Internal wall **			140.3					9	1262.7	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.36 (33)

DER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6133.32 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 81.67 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 10.22 (36)

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

Total fabric heat loss (33) + (36) = 42.57 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	20.38	20.14	19.89	18.64	18.39	17.14	17.14	16.89	17.64	18.39	18.89	19.39	(38)

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

(39)m=	62.96	62.71	62.46	61.21	60.96	59.72	59.72	59.47	60.22	60.96	61.46	61.96	

Average = Sum(39)$_{1...12}$ /12= 61.15 (39)

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

(40)m=	0.84	0.84	0.83	0.82	0.81	0.8	0.8	0.79	0.8	0.81	0.82	0.83	

Average = Sum(40)$_{1...12}$ /12= 0.81 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.36 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 90.33 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	99.36	95.75	92.14	88.52	84.91	81.3	81.3	84.91	88.52	92.14	95.75	99.36	

Total = Sum(44)$_{1...12}$ = 1083.95 (44)

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

(45)m=	147.35	128.87	132.99	115.94	111.25	96	88.96	102.08	103.3	120.38	131.41	142.7	

Total = Sum(45)$_{1...12}$ = 1421.23 (45)

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

(46)m=	22.1	19.33	19.95	17.39	16.69	14.4	13.34	15.31	15.49	18.06	19.71	21.41	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

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

DER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	161.41	141.57	147.05	129.55	125.31	109.61	103.02	116.14	116.91	134.45	145.02	156.76	(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=	161.41	141.57	147.05	129.55	125.31	109.61	103.02	116.14	116.91	134.45	145.02	156.76	

Output from water heater (annual)$_{1...12}$ 1586.79 (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=	48.99	42.85	44.22	38.55	36.99	31.92	29.58	33.94	34.35	40.03	43.69	47.45	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	(66)

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

(67)m=	18.62	16.54	13.45	10.18	7.61	6.43	6.94	9.03	12.12	15.38	17.96	19.14	(67)

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

(68)m=	208.9	211.06	205.6	193.97	179.29	165.5	156.28	154.11	159.57	171.2	185.88	199.68	(68)

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

(69)m=	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	(69)

Pumps and fans gains (Table 5a)

(70)m=	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	(70)

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

(71)m=	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	(71)

Water heating gains (Table 5)

(72)m=	65.85	63.77	59.43	53.54	49.72	44.33	39.76	45.62	47.7	53.8	60.69	63.77	(72)

DER WorkSheet: New dwelling design stage

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

(73)m=	362.19	360.18	347.3	326.51	305.44	285.07	271.79	277.57	288.21	309.2	333.34	351.41	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9x	0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North 0.9x	0.77	x	2.87	x	10.63	x	0.63	x	0.7	=	18.65	(74)
North 0.9x	0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North 0.9x	0.77	x	2.87	x	20.32	x	0.63	x	0.7	=	35.65	(74)
North 0.9x	0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North 0.9x	0.77	x	2.87	x	34.53	x	0.63	x	0.7	=	60.57	(74)
North 0.9x	0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North 0.9x	0.77	x	2.87	x	55.46	x	0.63	x	0.7	=	97.3	(74)
North 0.9x	0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North 0.9x	0.77	x	2.87	x	74.72	x	0.63	x	0.7	=	131.07	(74)
North 0.9x	0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North 0.9x	0.77	x	2.87	x	79.99	x	0.63	x	0.7	=	140.31	(74)
North 0.9x	0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North 0.9x	0.77	x	2.87	x	74.68	x	0.63	x	0.7	=	131	(74)
North 0.9x	0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North 0.9x	0.77	x	2.87	x	59.25	x	0.63	x	0.7	=	103.93	(74)
North 0.9x	0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North 0.9x	0.77	x	2.87	x	41.52	x	0.63	x	0.7	=	72.83	(74)
North 0.9x	0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North 0.9x	0.77	x	2.87	x	24.19	x	0.63	x	0.7	=	42.43	(74)
North 0.9x	0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North 0.9x	0.77	x	2.87	x	13.12	x	0.63	x	0.7	=	23.01	(74)
North 0.9x	0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
North 0.9x	0.77	x	2.87	x	8.86	x	0.63	x	0.7	=	15.55	(74)
Northeast 0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(75)
Northeast 0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(75)
Northeast 0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(75)
Northeast 0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(75)
Northeast 0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(75)
Northeast 0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(75)
Northeast 0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(75)
Northeast 0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(75)
Northeast 0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(75)
Northeast 0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(75)

DER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(75)
Northeast	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(75)
East	0.9x	0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(76)
East	0.9x	0.77	x	5.54	x	19.64	x	0.51	x	0.8	=	30.76	(76)
East	0.9x	0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(76)
East	0.9x	0.77	x	5.54	x	38.42	x	0.51	x	0.8	=	60.18	(76)
East	0.9x	0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(76)
East	0.9x	0.77	x	5.54	x	63.27	x	0.51	x	0.8	=	99.11	(76)
East	0.9x	0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(76)
East	0.9x	0.77	x	5.54	x	92.28	x	0.51	x	0.8	=	144.55	(76)
East	0.9x	0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(76)
East	0.9x	0.77	x	5.54	x	113.09	x	0.51	x	0.8	=	177.15	(76)
East	0.9x	0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(76)
East	0.9x	0.77	x	5.54	x	115.77	x	0.51	x	0.8	=	181.34	(76)
East	0.9x	0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(76)
East	0.9x	0.77	x	5.54	x	110.22	x	0.51	x	0.8	=	172.65	(76)
East	0.9x	0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(76)
East	0.9x	0.77	x	5.54	x	94.68	x	0.51	x	0.8	=	148.3	(76)
East	0.9x	0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(76)
East	0.9x	0.77	x	5.54	x	73.59	x	0.51	x	0.8	=	115.27	(76)
East	0.9x	0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(76)
East	0.9x	0.77	x	5.54	x	45.59	x	0.51	x	0.8	=	71.41	(76)
East	0.9x	0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(76)
East	0.9x	0.77	x	5.54	x	24.49	x	0.51	x	0.8	=	38.36	(76)
East	0.9x	0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(76)
East	0.9x	0.77	x	5.54	x	16.15	x	0.51	x	0.8	=	25.3	(76)
South	0.9x	0.77	x	1.73	x	46.75	x	0.51	x	0.8	=	22.87	(78)
South	0.9x	0.77	x	1.51	x	46.75	x	0.63	x	0.7	=	21.57	(78)
South	0.9x	0.77	x	1.73	x	76.57	x	0.51	x	0.8	=	37.45	(78)
South	0.9x	0.77	x	1.51	x	76.57	x	0.63	x	0.7	=	35.33	(78)
South	0.9x	0.77	x	1.73	x	97.53	x	0.51	x	0.8	=	47.71	(78)
South	0.9x	0.77	x	1.51	x	97.53	x	0.63	x	0.7	=	45.01	(78)
South	0.9x	0.77	x	1.73	x	110.23	x	0.51	x	0.8	=	53.92	(78)
South	0.9x	0.77	x	1.51	x	110.23	x	0.63	x	0.7	=	50.87	(78)
South	0.9x	0.77	x	1.73	x	114.87	x	0.51	x	0.8	=	56.19	(78)
South	0.9x	0.77	x	1.51	x	114.87	x	0.63	x	0.7	=	53.01	(78)
South	0.9x	0.77	x	1.73	x	110.55	x	0.51	x	0.8	=	54.07	(78)
South	0.9x	0.77	x	1.51	x	110.55	x	0.63	x	0.7	=	51.02	(78)
South	0.9x	0.77	x	1.73	x	108.01	x	0.51	x	0.8	=	52.83	(78)
South	0.9x	0.77	x	1.51	x	108.01	x	0.63	x	0.7	=	49.84	(78)
South	0.9x	0.77	x	1.73	x	104.89	x	0.51	x	0.8	=	51.31	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.51	x	104.89	x	0.63	x	0.7	=	48.41	(78)
South	0.9x	0.77	x	1.73	x	101.89	x	0.51	x	0.8	=	49.84	(78)
South	0.9x	0.77	x	1.51	x	101.89	x	0.63	x	0.7	=	47.02	(78)
South	0.9x	0.77	x	1.73	x	82.59	x	0.51	x	0.8	=	40.4	(78)
South	0.9x	0.77	x	1.51	x	82.59	x	0.63	x	0.7	=	38.11	(78)
South	0.9x	0.77	x	1.73	x	55.42	x	0.51	x	0.8	=	27.11	(78)
South	0.9x	0.77	x	1.51	x	55.42	x	0.63	x	0.7	=	25.57	(78)
South	0.9x	0.77	x	1.73	x	40.4	x	0.51	x	0.8	=	19.76	(78)
South	0.9x	0.77	x	1.51	x	40.4	x	0.63	x	0.7	=	18.64	(78)
Northwest	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(81)
Northwest	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(81)
Northwest	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(81)
Northwest	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(81)
Northwest	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(81)
Northwest	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(81)
Northwest	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(81)
Northwest	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(81)
Northwest	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(81)
Northwest	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(81)
Northwest	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(81)
Northwest	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(81)

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

(83)m=	131.13	242.41	379.06	543.79	672.91	695.09	658.96	559.17	435.92	281.01	160.61	109.88	(83)

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

(84)m=	493.31	602.6	726.36	870.3	978.34	980.16	930.75	836.74	724.12	590.21	493.95	461.29	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.93	0.89	0.81	0.68	0.52	0.37	0.28	0.32	0.52	0.77	0.9	0.94	(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=	20.58	20.58	20.58	20.59	20.59	20.6	20.6	20.6	20.6	20.59	20.59	20.59	(88)

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

(89)m=	0.93	0.88	0.8	0.66	0.5	0.35	0.25	0.29	0.49	0.75	0.89	0.94	(89)

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

(90)m=	20.58	20.58	20.58	20.59	20.59	20.6	20.6	20.6	20.6	20.59	20.59	20.59	(90)

fLA = Living area ÷ (4) = 0.41 (91)

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

DER WorkSheet: New dwelling design stage

(92)m=	20.75	20.75	20.76	20.76	20.76	20.77	20.77	20.77	20.76	20.76	20.76	20.76	(92)

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

(93)m=	20.75	20.75	20.76	20.76	20.76	20.77	20.77	20.77	20.76	20.76	20.76	20.76	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.93	0.89	0.81	0.67	0.51	0.36	0.26	0.3	0.5	0.76	0.9	0.94	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	459	534.4	586.89	583.38	499.83	354.53	244.83	253.71	365.09	447.85	442.36	433.62	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1035.93	994.26	890.43	726.04	552.44	368.25	248.82	259.73	401.32	619.5	839.57	1025.96	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	429.24	309.03	225.84	102.72	39.14	0	0	0	0	127.71	285.99	440.69	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1960.36 (98)

Space heating requirement in kWh/m²/year 26.1 (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 1 509.84 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	429.24	309.03	225.84	102.72	39.14	0	0	0	0	127.71	285.99	440.69	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	84.19	60.61	44.3	20.15	7.68	0	0	0	0	25.05	56.09	86.44	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 384.5 (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)

	161.41	141.57	147.05	129.55	125.31	109.61	103.02	116.14	116.91	134.45	145.02	156.76	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	83.13	72.91	75.73	66.72	64.53	56.45	53.05	59.81	60.21	69.24	74.68	80.73	

Total = Sum(219a)$_{1...12}$ = 817.18 (219)

DER WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		384.5	
Water heating fuel used		817.18	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	200.19		(230a)
warm air heating system fans	103.64		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		303.83	(231)
Electricity for lighting		328.89	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1834.4	(338)

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

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519 =	199.56	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.519 =	424.11	(264)
Space and water heating	(261) + (262) + (263) + (264) =		623.67	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	157.69	(267)
Electricity for lighting	(232) x	0.519 =	170.7	(268)
Total CO2, kg/year	sum of (265)…(271) =		952.05	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =		12.68	(273)
EI rating (section 14)			89	(274)

Predicted Energy Assessment

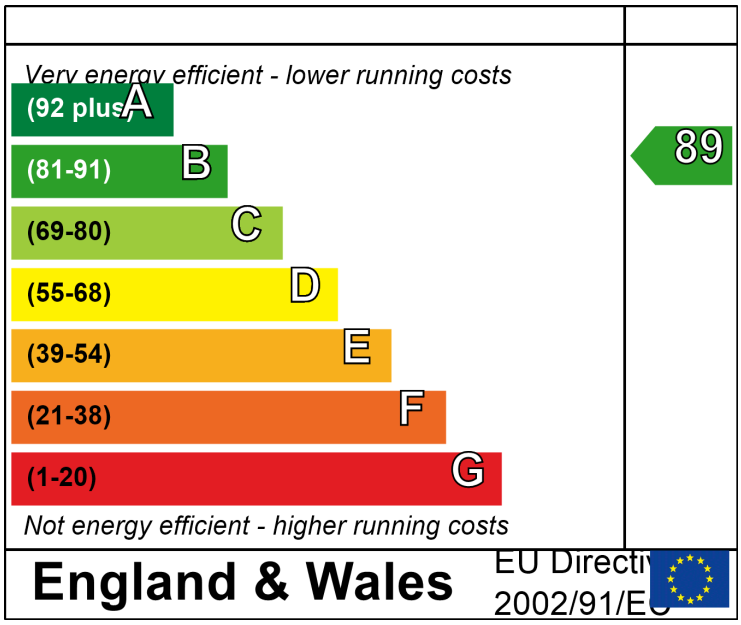
FLAT 08
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 75.1 m²

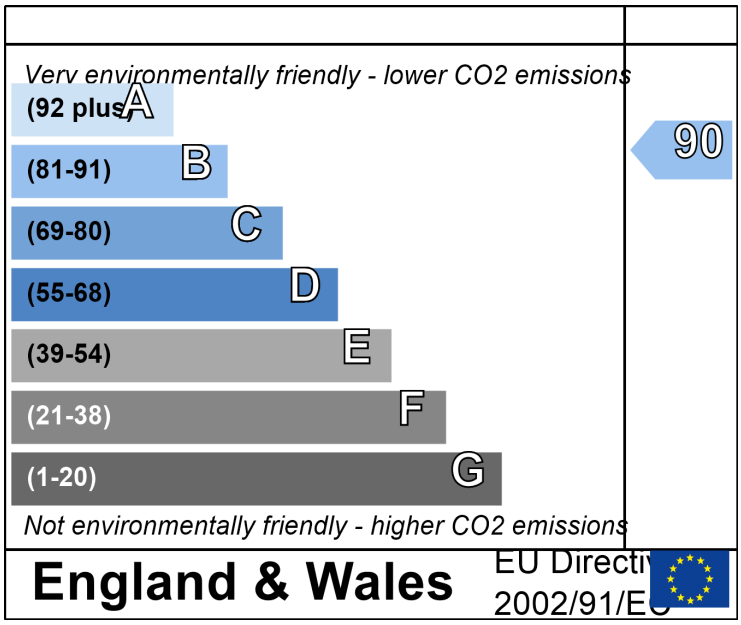
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about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

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 08

Address : FLAT 08, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	75.1	(1a) x	2.3	(2a) =	172.73	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	75.1	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		172.73	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

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

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

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

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 2			1.71	x1/[1/(1.1)+ 0.04]		=	1.8			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 6			1.73	x1/[1/(0.92)+ 0.04]		=	1.54			(27)
Windows Type 7			5.54	x1/[1/(0.92)+ 0.04]		=	4.92			(27)
Windows Type 8			1.51	x1/[1/(1.1)+ 0.04]		=	1.59			(27)
Walls Type1	16.79	2.1	14.69	x	0.19	=	2.79	14	205.66	(29)
Walls Type2	50.14	23.3	26.84	x	0.16	=	4.29	14	375.76	(29)
Roof	1.2	0	1.2	x	0.12	=	0.14	9	10.8	(30)
Total area of elements, m²			68.13							(31)
Party wall			27.37	x	0	=	0	20	547.4	(32)
Party floor			75.1					30	2253	(32a)
Party ceiling			73.9					20	1478	(32b)
Internal wall **			140.3					9	1262.7	(32c)

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

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

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.36 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6133.32 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 81.67 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 10.22 (36)

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

Total fabric heat loss (33) + (36) = 42.57 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	20.38	20.14	19.89	18.64	18.39	17.14	17.14	16.89	17.64	18.39	18.89	19.39	(38)

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

(39)m=	62.96	62.71	62.46	61.21	60.96	59.72	59.72	59.47	60.22	60.96	61.46	61.96	

Average = Sum(39)$_{1...12}$ /12= 61.15 (39)

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

(40)m=	0.84	0.84	0.83	0.82	0.81	0.8	0.8	0.79	0.8	0.81	0.82	0.83	

Average = Sum(40)$_{1...12}$ /12= 0.81 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.36 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 90.33 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	99.36	95.75	92.14	88.52	84.91	81.3	81.3	84.91	88.52	92.14	95.75	99.36	

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

Total = Sum(44)$_{1...12}$ = 1083.95 (44)

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

(45)m=	147.35	128.87	132.99	115.94	111.25	96	88.96	102.08	103.3	120.38	131.41	142.7	

Total = Sum(45)$_{1...12}$ = 1421.23 (45)

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

(46)m=	22.1	19.33	19.95	17.39	16.69	14.4	13.34	15.31	15.49	18.06	19.71	21.41	(46)

Water storage loss:

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

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

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

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

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

SAP WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

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

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

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

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

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

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

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

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

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

(62)m=	161.41	141.57	147.05	129.55	125.31	109.61	103.02	116.14	116.91	134.45	145.02	156.76	(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=	161.41	141.57	147.05	129.55	125.31	109.61	103.02	116.14	116.91	134.45	145.02	156.76	

Output from water heater (annual)$_{1...12}$: 1586.79 (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=	48.99	42.85	44.22	38.55	36.99	31.92	29.58	33.94	34.35	40.03	43.69	47.45	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	141.8	(66)

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

(67)m=	46.56	41.35	33.63	25.46	19.03	16.07	17.36	22.57	30.29	38.46	44.89	47.85	(67)

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

(68)m=	311.79	315.02	306.87	289.51	267.6	247.01	233.25	230.02	238.17	255.53	277.44	298.03	(68)

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

(69)m=	51.54	51.54	51.54	51.54	51.54	51.54	51.54	51.54	51.54	51.54	51.54	51.54	(69)

Pumps and fans gains (Table 5a)

(70)m=	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	10.36	(70)

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

(71)m=	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	(71)

Water heating gains (Table 5)

(72)m=	65.85	63.77	59.43	53.54	49.72	44.33	39.76	45.62	47.7	53.8	60.69	63.77	(72)

SAP WorkSheet: New dwelling design stage

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

(73)m=	533.37	529.31	509.1	477.69	445.52	416.58	399.54	407.38	425.34	456.96	492.18	518.83

(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)	
North	0.9x	1	x	1.71	x	10.63	x	0.63	x	0.7	=	7.22 (74)
North	0.9x	1	x	2.87	x	10.63	x	0.63	x	0.7	=	24.23 (74)
North	0.9x	1	x	1.71	x	20.32	x	0.63	x	0.7	=	13.79 (74)
North	0.9x	1	x	2.87	x	20.32	x	0.63	x	0.7	=	46.3 (74)
North	0.9x	1	x	1.71	x	34.53	x	0.63	x	0.7	=	23.44 (74)
North	0.9x	1	x	2.87	x	34.53	x	0.63	x	0.7	=	78.67 (74)
North	0.9x	1	x	1.71	x	55.46	x	0.63	x	0.7	=	37.64 (74)
North	0.9x	1	x	2.87	x	55.46	x	0.63	x	0.7	=	126.36 (74)
North	0.9x	1	x	1.71	x	74.72	x	0.63	x	0.7	=	50.71 (74)
North	0.9x	1	x	2.87	x	74.72	x	0.63	x	0.7	=	170.22 (74)
North	0.9x	1	x	1.71	x	79.99	x	0.63	x	0.7	=	54.29 (74)
North	0.9x	1	x	2.87	x	79.99	x	0.63	x	0.7	=	182.22 (74)
North	0.9x	1	x	1.71	x	74.68	x	0.63	x	0.7	=	50.68 (74)
North	0.9x	1	x	2.87	x	74.68	x	0.63	x	0.7	=	170.13 (74)
North	0.9x	1	x	1.71	x	59.25	x	0.63	x	0.7	=	40.21 (74)
North	0.9x	1	x	2.87	x	59.25	x	0.63	x	0.7	=	134.98 (74)
North	0.9x	1	x	1.71	x	41.52	x	0.63	x	0.7	=	28.18 (74)
North	0.9x	1	x	2.87	x	41.52	x	0.63	x	0.7	=	94.58 (74)
North	0.9x	1	x	1.71	x	24.19	x	0.63	x	0.7	=	16.42 (74)
North	0.9x	1	x	2.87	x	24.19	x	0.63	x	0.7	=	55.11 (74)
North	0.9x	1	x	1.71	x	13.12	x	0.63	x	0.7	=	8.9 (74)
North	0.9x	1	x	2.87	x	13.12	x	0.63	x	0.7	=	29.88 (74)
North	0.9x	1	x	1.71	x	8.86	x	0.63	x	0.7	=	6.02 (74)
North	0.9x	1	x	2.87	x	8.86	x	0.63	x	0.7	=	20.2 (74)
Northeast	0.9x	1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4 (75)
Northeast	0.9x	1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14 (75)
Northeast	0.9x	1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49 (75)
Northeast	0.9x	1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64 (75)
Northeast	0.9x	1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14 (75)
Northeast	0.9x	1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17 (75)
Northeast	0.9x	1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93 (75)
Northeast	0.9x	1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53 (75)
Northeast	0.9x	1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03 (75)
Northeast	0.9x	1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39 (75)

SAP WorkSheet: New dwelling design stage

Northeast	0.9x	1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(75)
Northeast	0.9x	1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(75)
East	0.9x	1	x	2.87	x	19.64	x	0.63	x	0.7	=	22.37	(76)
East	0.9x	1	x	5.54	x	19.64	x	0.51	x	0.8	=	39.95	(76)
East	0.9x	1	x	2.87	x	38.42	x	0.63	x	0.7	=	43.76	(76)
East	0.9x	1	x	5.54	x	38.42	x	0.51	x	0.8	=	78.16	(76)
East	0.9x	1	x	2.87	x	63.27	x	0.63	x	0.7	=	72.07	(76)
East	0.9x	1	x	5.54	x	63.27	x	0.51	x	0.8	=	128.72	(76)
East	0.9x	1	x	2.87	x	92.28	x	0.63	x	0.7	=	105.12	(76)
East	0.9x	1	x	5.54	x	92.28	x	0.51	x	0.8	=	187.72	(76)
East	0.9x	1	x	2.87	x	113.09	x	0.63	x	0.7	=	128.82	(76)
East	0.9x	1	x	5.54	x	113.09	x	0.51	x	0.8	=	230.06	(76)
East	0.9x	1	x	2.87	x	115.77	x	0.63	x	0.7	=	131.87	(76)
East	0.9x	1	x	5.54	x	115.77	x	0.51	x	0.8	=	235.51	(76)
East	0.9x	1	x	2.87	x	110.22	x	0.63	x	0.7	=	125.55	(76)
East	0.9x	1	x	5.54	x	110.22	x	0.51	x	0.8	=	224.22	(76)
East	0.9x	1	x	2.87	x	94.68	x	0.63	x	0.7	=	107.85	(76)
East	0.9x	1	x	5.54	x	94.68	x	0.51	x	0.8	=	192.6	(76)
East	0.9x	1	x	2.87	x	73.59	x	0.63	x	0.7	=	83.83	(76)
East	0.9x	1	x	5.54	x	73.59	x	0.51	x	0.8	=	149.7	(76)
East	0.9x	1	x	2.87	x	45.59	x	0.63	x	0.7	=	51.93	(76)
East	0.9x	1	x	5.54	x	45.59	x	0.51	x	0.8	=	92.74	(76)
East	0.9x	1	x	2.87	x	24.49	x	0.63	x	0.7	=	27.9	(76)
East	0.9x	1	x	5.54	x	24.49	x	0.51	x	0.8	=	49.82	(76)
East	0.9x	1	x	2.87	x	16.15	x	0.63	x	0.7	=	18.4	(76)
East	0.9x	1	x	5.54	x	16.15	x	0.51	x	0.8	=	32.86	(76)
South	0.9x	1	x	1.73	x	46.75	x	0.51	x	0.8	=	29.7	(78)
South	0.9x	1	x	1.51	x	46.75	x	0.63	x	0.7	=	28.02	(78)
South	0.9x	1	x	1.73	x	76.57	x	0.51	x	0.8	=	48.64	(78)
South	0.9x	1	x	1.51	x	76.57	x	0.63	x	0.7	=	45.89	(78)
South	0.9x	1	x	1.73	x	97.53	x	0.51	x	0.8	=	61.96	(78)
South	0.9x	1	x	1.51	x	97.53	x	0.63	x	0.7	=	58.45	(78)
South	0.9x	1	x	1.73	x	110.23	x	0.51	x	0.8	=	70.03	(78)
South	0.9x	1	x	1.51	x	110.23	x	0.63	x	0.7	=	66.07	(78)
South	0.9x	1	x	1.73	x	114.87	x	0.51	x	0.8	=	72.97	(78)
South	0.9x	1	x	1.51	x	114.87	x	0.63	x	0.7	=	68.84	(78)
South	0.9x	1	x	1.73	x	110.55	x	0.51	x	0.8	=	70.23	(78)
South	0.9x	1	x	1.51	x	110.55	x	0.63	x	0.7	=	66.25	(78)
South	0.9x	1	x	1.73	x	108.01	x	0.51	x	0.8	=	68.62	(78)
South	0.9x	1	x	1.51	x	108.01	x	0.63	x	0.7	=	64.73	(78)
South	0.9x	1	x	1.73	x	104.89	x	0.51	x	0.8	=	66.63	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	1	x	1.51	x	104.89	x	0.63	x	0.7	=	62.87	(78)
South	0.9x	1	x	1.73	x	101.89	x	0.51	x	0.8	=	64.72	(78)
South	0.9x	1	x	1.51	x	101.89	x	0.63	x	0.7	=	61.06	(78)
South	0.9x	1	x	1.73	x	82.59	x	0.51	x	0.8	=	52.46	(78)
South	0.9x	1	x	1.51	x	82.59	x	0.63	x	0.7	=	49.5	(78)
South	0.9x	1	x	1.73	x	55.42	x	0.51	x	0.8	=	35.2	(78)
South	0.9x	1	x	1.51	x	55.42	x	0.63	x	0.7	=	33.21	(78)
South	0.9x	1	x	1.73	x	40.4	x	0.51	x	0.8	=	25.66	(78)
South	0.9x	1	x	1.51	x	40.4	x	0.63	x	0.7	=	24.21	(78)
Northwest	0.9x	1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4	(81)
Northwest	0.9x	1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14	(81)
Northwest	0.9x	1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49	(81)
Northwest	0.9x	1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64	(81)
Northwest	0.9x	1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14	(81)
Northwest	0.9x	1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17	(81)
Northwest	0.9x	1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93	(81)
Northwest	0.9x	1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53	(81)
Northwest	0.9x	1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03	(81)
Northwest	0.9x	1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39	(81)
Northwest	0.9x	1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(81)
Northwest	0.9x	1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(81)

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

(83)m=	170.3	314.82	492.28	706.22	873.9	902.71	855.79	726.2	566.12	364.94	208.58	142.7	(83)

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

(84)m=	703.67	844.14	1001.39	1183.9	1319.43	1319.29	1255.33	1133.57	991.46	821.9	700.77	661.53	(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=	0.86	0.8	0.7	0.55	0.41	0.28	0.21	0.24	0.4	0.64	0.81	0.88	(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=	20.58	20.58	20.58	20.59	20.59	20.6	20.6	20.6	20.6	20.59	20.59	20.59	(88)

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

(89)m=	0.86	0.79	0.69	0.54	0.39	0.27	0.19	0.22	0.38	0.62	0.8	0.87	(89)

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

(90)m=	20.58	20.58	20.58	20.59	20.59	20.6	20.6	20.6	20.6	20.59	20.59	20.59	(90)

fLA = Living area ÷ (4) = 0.41 (91)

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

SAP WorkSheet: New dwelling design stage

(92)m=	20.75	20.75	20.76	20.76	20.76	20.77	20.77	20.77	20.76	20.76	20.76	20.76	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.75	20.75	20.76	20.76	20.76	20.77	20.77	20.77	20.76	20.76	20.76	20.76	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.86	0.79	0.69	0.54	0.4	0.27	0.2	0.23	0.39	0.63	0.8	0.87	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	604.61	670.8	694.34	644.1	524.93	361.66	246.99	256.97	383.22	517.31	562.58	578.26	(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=	1035.93	994.26	890.43	726.04	552.44	368.25	248.82	259.73	401.32	619.5	839.57	1025.96	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	320.9	217.37	145.89	59	20.47	0	0	0	0	76.03	199.43	333.09	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1372.18 (98)

Space heating requirement in kWh/m²/year 18.27 (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 1 509.84 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	320.9	217.37	145.89	59	20.47	0	0	0	0	76.03	199.43	333.09	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	62.94	42.63	28.62	11.57	4.01	0	0	0	0	14.91	39.12	65.33	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 269.14 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	161.41	141.57	147.05	129.55	125.31	109.61	103.02	116.14	116.91	134.45	145.02	156.76	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	83.13	72.91	75.73	66.72	64.53	56.45	53.05	59.81	60.21	69.24	74.68	80.73	

Total = Sum(219a)$_{1...12}$ = 817.18 (219)

SAP WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		269.14	
Water heating fuel used		817.18	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	200.19		(230a)
warm air heating system fans	103.64		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		303.83	(231)
Electricity for lighting		328.89	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1719.04	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	35.5	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	107.79	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	40.08	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a					
Energy for lighting	(232)	13.19	x 0.01 =	43.38	(250)
Additional standing charges (Table 12)				0	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost (245)...(247) + (250)…(254) =				226.74	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.79	(257)
SAP rating (Section 12)	88.94	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	139.68	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	424.11	(264)
Space and water heating	(261) + (262) + (263) + (264) =			563.8	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	157.69	(267)
Electricity for lighting	(232) x	0.519	=	170.7	(268)
Total CO2, kg/year sum of (265)…(271) =				892.18	(272)

SAP WorkSheet: New dwelling design stage

CO2 emissions per m²	(272) ÷ (4) =	11.88	(273)
EI rating (section 14)		90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	826.25	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	2508.73	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3334.98	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	932.76	(267)
Electricity for lighting	(232)	x	0	=	1009.7	(268)
‘Total Primary Energy	sum of (265)…(271) =				5277.45	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				70.27	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 08

Address : FLAT 08, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	75.1 (1a)	x	2.3 (2a)	=	172.73	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	75.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	172.73	(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) =	0.17	(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)			0.42	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.3	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.38	0.37	0.36	0.33	0.32	0.28	0.28	0.27	0.3	0.32	0.33	0.35

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=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			2.05	x1/[1/(1.4)+ 0.04]		=	2.72			(27)
Windows Type 2			1.22	x1/[1/(1.4)+ 0.04]		=	1.62			(27)
Windows Type 3			2.05	x1/[1/(1.4)+ 0.04]		=	2.72			(27)
Windows Type 4			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(27)
Windows Type 5			1.5	x1/[1/(1.4)+ 0.04]		=	1.99			(27)
Windows Type 6			1.24	x1/[1/(1.4)+ 0.04]		=	1.64			(27)
Windows Type 7			3.96	x1/[1/(1.4)+ 0.04]		=	5.25			(27)
Windows Type 8			1.08	x1/[1/(1.4)+ 0.04]		=	1.43			(27)
Walls Type1	16.79	2.1	14.69	x	0.18	=	2.64			(29)
Walls Type2	50.14	16.65	33.49	x	0.18	=	6.03			(29)
Roof	1.2	0	1.2	x	0.13	=	0.16			(30)
Total area of elements, m²			68.13							(31)
Party wall			27.37	x	0	=	0			(32)
Party floor			75.1							(32a)
Party ceiling			73.9							(32b)
Internal wall **			140.3							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 33 (33)

TER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6226.42 (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 3.41 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.41 (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=	32.58	32.42	32.26	31.53	31.4	30.76	30.76	30.65	31.01	31.4	31.67	31.96	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	68.98	68.83	68.67	67.94	67.81	67.17	67.17	67.05	67.42	67.81	68.08	68.37	

Average = Sum(39)$_{1...12}$ /12= 67.94 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.92	0.92	0.91	0.9	0.9	0.89	0.89	0.89	0.9	0.9	0.91	0.91	

Average = Sum(40)$_{1...12}$ /12= 0.9 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.36 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 90.33 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	99.36	95.75	92.14	88.52	84.91	81.3	81.3	84.91	88.52	92.14	95.75	99.36	

Total = Sum(44)$_{1...12}$ = 1083.95 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	147.35	128.87	132.99	115.94	111.25	96	88.96	102.08	103.3	120.38	131.41	142.7	

Total = Sum(45)$_{1...12}$ = 1421.23 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.1	19.33	19.95	17.39	16.69	14.4	13.34	15.31	15.49	18.06	19.71	21.41	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

TER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	196.59	173.35	182.23	163.59	160.49	143.65	138.2	151.32	150.95	169.63	179.06	191.94	(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=	196.59	173.35	182.23	163.59	160.49	143.65	138.2	151.32	150.95	169.63	179.06	191.94	

Output from water heater (annual)$_{1...12}$ — 2001.02 — (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=	88.39	78.43	83.61	76.67	76.38	70.04	68.97	73.34	72.47	79.42	81.82	86.84	(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=	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	118.17	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.63	16.54	13.45	10.19	7.61	6.43	6.95	9.03	12.12	15.39	17.96	19.14	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	208.9	211.06	205.6	193.97	179.29	165.5	156.28	154.11	159.57	171.2	185.88	199.68	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	34.82	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	-94.53	(71)

Water heating gains (Table 5)

(72)m=	118.8	116.71	112.38	106.49	102.67	97.28	92.7	98.57	100.65	106.75	113.63	116.72	(72)

TER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	407.77	405.77	392.89	372.1	351.02	330.66	317.38	323.16	333.79	354.79	378.92	397	(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	1.22	x	10.63	x	0.63	x	0.7	=	3.96	(74)
North	0.9x 0.77	x	2.05	x	10.63	x	0.63	x	0.7	=	13.32	(74)
North	0.9x 0.77	x	1.22	x	20.32	x	0.63	x	0.7	=	7.58	(74)
North	0.9x 0.77	x	2.05	x	20.32	x	0.63	x	0.7	=	25.46	(74)
North	0.9x 0.77	x	1.22	x	34.53	x	0.63	x	0.7	=	12.87	(74)
North	0.9x 0.77	x	2.05	x	34.53	x	0.63	x	0.7	=	43.27	(74)
North	0.9x 0.77	x	1.22	x	55.46	x	0.63	x	0.7	=	20.68	(74)
North	0.9x 0.77	x	2.05	x	55.46	x	0.63	x	0.7	=	69.5	(74)
North	0.9x 0.77	x	1.22	x	74.72	x	0.63	x	0.7	=	27.86	(74)
North	0.9x 0.77	x	2.05	x	74.72	x	0.63	x	0.7	=	93.62	(74)
North	0.9x 0.77	x	1.22	x	79.99	x	0.63	x	0.7	=	29.82	(74)
North	0.9x 0.77	x	2.05	x	79.99	x	0.63	x	0.7	=	100.22	(74)
North	0.9x 0.77	x	1.22	x	74.68	x	0.63	x	0.7	=	27.84	(74)
North	0.9x 0.77	x	2.05	x	74.68	x	0.63	x	0.7	=	93.57	(74)
North	0.9x 0.77	x	1.22	x	59.25	x	0.63	x	0.7	=	22.09	(74)
North	0.9x 0.77	x	2.05	x	59.25	x	0.63	x	0.7	=	74.24	(74)
North	0.9x 0.77	x	1.22	x	41.52	x	0.63	x	0.7	=	15.48	(74)
North	0.9x 0.77	x	2.05	x	41.52	x	0.63	x	0.7	=	52.02	(74)
North	0.9x 0.77	x	1.22	x	24.19	x	0.63	x	0.7	=	9.02	(74)
North	0.9x 0.77	x	2.05	x	24.19	x	0.63	x	0.7	=	30.31	(74)
North	0.9x 0.77	x	1.22	x	13.12	x	0.63	x	0.7	=	4.89	(74)
North	0.9x 0.77	x	2.05	x	13.12	x	0.63	x	0.7	=	16.44	(74)
North	0.9x 0.77	x	1.22	x	8.86	x	0.63	x	0.7	=	3.31	(74)
North	0.9x 0.77	x	2.05	x	8.86	x	0.63	x	0.7	=	11.11	(74)
Northeast	0.9x 0.77	x	1.5	x	11.28	x	0.63	x	0.7	=	5.17	(75)
Northeast	0.9x 0.77	x	1.5	x	22.97	x	0.63	x	0.7	=	10.53	(75)
Northeast	0.9x 0.77	x	1.5	x	41.38	x	0.63	x	0.7	=	18.97	(75)
Northeast	0.9x 0.77	x	1.5	x	67.96	x	0.63	x	0.7	=	31.15	(75)
Northeast	0.9x 0.77	x	1.5	x	91.35	x	0.63	x	0.7	=	41.87	(75)
Northeast	0.9x 0.77	x	1.5	x	97.38	x	0.63	x	0.7	=	44.64	(75)
Northeast	0.9x 0.77	x	1.5	x	91.1	x	0.63	x	0.7	=	41.76	(75)
Northeast	0.9x 0.77	x	1.5	x	72.63	x	0.63	x	0.7	=	33.29	(75)
Northeast	0.9x 0.77	x	1.5	x	50.42	x	0.63	x	0.7	=	23.11	(75)
Northeast	0.9x 0.77	x	1.5	x	28.07	x	0.63	x	0.7	=	12.87	(75)

TER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	1.5	x	14.2	x	0.63	x	0.7	=	6.51	(75)
Northeast	0.9x	0.77	x	1.5	x	9.21	x	0.63	x	0.7	=	4.22	(75)
East	0.9x	0.77	x	2.05	x	19.64	x	0.63	x	0.7	=	12.3	(76)
East	0.9x	0.77	x	3.96	x	19.64	x	0.63	x	0.7	=	23.77	(76)
East	0.9x	0.77	x	2.05	x	38.42	x	0.63	x	0.7	=	24.07	(76)
East	0.9x	0.77	x	3.96	x	38.42	x	0.63	x	0.7	=	46.5	(76)
East	0.9x	0.77	x	2.05	x	63.27	x	0.63	x	0.7	=	39.64	(76)
East	0.9x	0.77	x	3.96	x	63.27	x	0.63	x	0.7	=	76.57	(76)
East	0.9x	0.77	x	2.05	x	92.28	x	0.63	x	0.7	=	57.81	(76)
East	0.9x	0.77	x	3.96	x	92.28	x	0.63	x	0.7	=	111.68	(76)
East	0.9x	0.77	x	2.05	x	113.09	x	0.63	x	0.7	=	70.85	(76)
East	0.9x	0.77	x	3.96	x	113.09	x	0.63	x	0.7	=	136.87	(76)
East	0.9x	0.77	x	2.05	x	115.77	x	0.63	x	0.7	=	72.53	(76)
East	0.9x	0.77	x	3.96	x	115.77	x	0.63	x	0.7	=	140.11	(76)
East	0.9x	0.77	x	2.05	x	110.22	x	0.63	x	0.7	=	69.05	(76)
East	0.9x	0.77	x	3.96	x	110.22	x	0.63	x	0.7	=	133.39	(76)
East	0.9x	0.77	x	2.05	x	94.68	x	0.63	x	0.7	=	59.32	(76)
East	0.9x	0.77	x	3.96	x	94.68	x	0.63	x	0.7	=	114.58	(76)
East	0.9x	0.77	x	2.05	x	73.59	x	0.63	x	0.7	=	46.1	(76)
East	0.9x	0.77	x	3.96	x	73.59	x	0.63	x	0.7	=	89.06	(76)
East	0.9x	0.77	x	2.05	x	45.59	x	0.63	x	0.7	=	28.56	(76)
East	0.9x	0.77	x	3.96	x	45.59	x	0.63	x	0.7	=	55.17	(76)
East	0.9x	0.77	x	2.05	x	24.49	x	0.63	x	0.7	=	15.34	(76)
East	0.9x	0.77	x	3.96	x	24.49	x	0.63	x	0.7	=	29.64	(76)
East	0.9x	0.77	x	2.05	x	16.15	x	0.63	x	0.7	=	10.12	(76)
East	0.9x	0.77	x	3.96	x	16.15	x	0.63	x	0.7	=	19.55	(76)
South	0.9x	0.77	x	1.24	x	46.75	x	0.63	x	0.7	=	17.72	(78)
South	0.9x	0.77	x	1.08	x	46.75	x	0.63	x	0.7	=	15.43	(78)
South	0.9x	0.77	x	1.24	x	76.57	x	0.63	x	0.7	=	29.02	(78)
South	0.9x	0.77	x	1.08	x	76.57	x	0.63	x	0.7	=	25.27	(78)
South	0.9x	0.77	x	1.24	x	97.53	x	0.63	x	0.7	=	36.96	(78)
South	0.9x	0.77	x	1.08	x	97.53	x	0.63	x	0.7	=	32.19	(78)
South	0.9x	0.77	x	1.24	x	110.23	x	0.63	x	0.7	=	41.77	(78)
South	0.9x	0.77	x	1.08	x	110.23	x	0.63	x	0.7	=	36.38	(78)
South	0.9x	0.77	x	1.24	x	114.87	x	0.63	x	0.7	=	43.53	(78)
South	0.9x	0.77	x	1.08	x	114.87	x	0.63	x	0.7	=	37.91	(78)
South	0.9x	0.77	x	1.24	x	110.55	x	0.63	x	0.7	=	41.89	(78)
South	0.9x	0.77	x	1.08	x	110.55	x	0.63	x	0.7	=	36.49	(78)
South	0.9x	0.77	x	1.24	x	108.01	x	0.63	x	0.7	=	40.93	(78)
South	0.9x	0.77	x	1.08	x	108.01	x	0.63	x	0.7	=	35.65	(78)
South	0.9x	0.77	x	1.24	x	104.89	x	0.63	x	0.7	=	39.75	(78)

TER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.08	x	104.89	x	0.63	x	0.7	=	34.62	(78)
South	0.9x	0.77	x	1.24	x	101.89	x	0.63	x	0.7	=	38.61	(78)
South	0.9x	0.77	x	1.08	x	101.89	x	0.63	x	0.7	=	33.63	(78)
South	0.9x	0.77	x	1.24	x	82.59	x	0.63	x	0.7	=	31.3	(78)
South	0.9x	0.77	x	1.08	x	82.59	x	0.63	x	0.7	=	27.26	(78)
South	0.9x	0.77	x	1.24	x	55.42	x	0.63	x	0.7	=	21	(78)
South	0.9x	0.77	x	1.08	x	55.42	x	0.63	x	0.7	=	18.29	(78)
South	0.9x	0.77	x	1.24	x	40.4	x	0.63	x	0.7	=	15.31	(78)
South	0.9x	0.77	x	1.08	x	40.4	x	0.63	x	0.7	=	13.33	(78)
Northwest	0.9x	0.77	x	1.5	x	11.28	x	0.63	x	0.7	=	5.17	(81)
Northwest	0.9x	0.77	x	1.5	x	22.97	x	0.63	x	0.7	=	10.53	(81)
Northwest	0.9x	0.77	x	1.5	x	41.38	x	0.63	x	0.7	=	18.97	(81)
Northwest	0.9x	0.77	x	1.5	x	67.96	x	0.63	x	0.7	=	31.15	(81)
Northwest	0.9x	0.77	x	1.5	x	91.35	x	0.63	x	0.7	=	41.87	(81)
Northwest	0.9x	0.77	x	1.5	x	97.38	x	0.63	x	0.7	=	44.64	(81)
Northwest	0.9x	0.77	x	1.5	x	91.1	x	0.63	x	0.7	=	41.76	(81)
Northwest	0.9x	0.77	x	1.5	x	72.63	x	0.63	x	0.7	=	33.29	(81)
Northwest	0.9x	0.77	x	1.5	x	50.42	x	0.63	x	0.7	=	23.11	(81)
Northwest	0.9x	0.77	x	1.5	x	28.07	x	0.63	x	0.7	=	12.87	(81)
Northwest	0.9x	0.77	x	1.5	x	14.2	x	0.63	x	0.7	=	6.51	(81)
Northwest	0.9x	0.77	x	1.5	x	9.21	x	0.63	x	0.7	=	4.22	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	96.86	178.95	279.45	400.13	494.39	510.35	483.96	411.18	321.13	207.35	118.62	81.17	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	504.63	584.72	672.34	772.23	845.42	841.01	801.34	734.34	654.92	562.14	497.54	478.17	(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	0.71	0.51	0.37	0.42	0.68	0.94	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.15	20.31	20.55	20.82	20.96	21	21	21	20.98	20.77	20.41	20.12	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.15	20.15	20.16	20.16	20.17	20.17	20.17	20.17	20.17	20.17	20.16	20.16	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.96	0.86	0.66	0.44	0.3	0.34	0.61	0.91	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.02	19.25	19.59	19.96	20.13	20.17	20.17	20.17	20.15	19.91	19.4	18.98	(90)

fLA = Living area ÷ (4) = 0.41 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

TER WorkSheet: New dwelling design stage

(92)m=	19.49	19.69	19.99	20.32	20.47	20.51	20.51	20.51	20.49	20.26	19.81	19.45	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.49	19.69	19.99	20.32	20.47	20.51	20.51	20.51	20.49	20.26	19.81	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	0.98	0.96	0.86	0.68	0.47	0.33	0.38	0.64	0.92	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	501.44	575.85	642.85	665.19	572.57	394.98	262.7	275.46	419.18	515.1	490.21	475.9	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1047.72	1017.7	926.25	775.64	594.84	397.02	262.88	275.86	430.97	655.07	865.65	1042.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	406.43	296.93	210.85	79.52	16.57	0	0	0	0	104.14	270.32	421.76	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1806.52 (98)

Space heating requirement in kWh/m²/year 24.05 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.5 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	406.43	296.93	210.85	79.52	16.57	0	0	0	0	104.14	270.32	421.76	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	434.69	317.57	225.51	85.05	17.72	0	0	0	0	111.38	289.11	451.08	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1932.1 (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)

	196.59	173.35	182.23	163.59	160.49	143.65	138.2	151.32	150.95	169.63	179.06	191.94	

Efficiency of water heater 79.8 (216)

(217)m=	86.71	86.24	85.2	83.01	80.69	79.8	79.8	79.8	79.8	83.56	85.91	86.86	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	226.73	201.02	213.87	197.08	198.89	180.02	173.18	189.63	189.16	203.01	208.43	220.99	

Total = Sum(219a)$_{1...12}$ = 2402 (219)

TER WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		1932.1	
Water heating fuel used		2402	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75	(231)
Electricity for lighting		328.93	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4738.03	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	417.33	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	518.83	(264)
Space and water heating	(261) + (262) + (263) + (264) =				936.17	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	170.72	(268)
Total CO2, kg/year	sum of (265)…(271) =				1145.81	(272)

TER = 22.11 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:09

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 57.3m²

Site Reference : 43LS **Plot Reference:** FLAT 09

Address : FLAT 09, 43 London Street, Reading, RG1 4PS

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)	28.89 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.14 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.19 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.07 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.76	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Very Little
Windows facing: West	2.81m²
Windows facing: South	1.1m²
Windows facing: North	5.74m²
Windows facing: North West	2.1m²
Windows facing: North East	2.1m²
Windows facing: South	1.51m²
Ventilation rate:	6.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.85 W/m²K
Roofs U-value	0.11 W/m²K
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 09

Address : FLAT 09, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	57.3 (1a)	x	2.25 (2a)	=	128.92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	57.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.92	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			2.81	x1/[1/(1.1)+ 0.04]		=	2.96			(27)
Windows Type 2			1.1	x1/[1/(1.1)+ 0.04]		=	1.16			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 6			1.51	x1/[1/(1.1)+ 0.04]		=	1.59			(27)
Walls Type1	12.48	2.1	10.38	x	0.19	=	1.97	14	145.32	(29)
Walls Type2	20.56	0	20.56	x	0.16	=	3.29	14	287.84	(29)
Walls Type3	31.24	13.85	17.39	x	0.12	=	2.09	14	243.46	(29)
Walls Type4	8.58	1.51	7.07	x	0.12	=	0.85	14	98.98	(29)
Roof Type1	34.8	0	34.8	x	0.11	=	3.83	9	313.2	(30)
Roof Type2	23.2	0	23.2	x	0.11	=	2.55	9	208.8	(30)
Total area of elements, m²			130.86							(31)
Party wall			3.15	x	0	=	0	20	63	(32)
Party floor			57.3					30	1719	(32a)
Internal wall **			125.44					9	1128.96	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.55 (33)

DER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4208.56 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 73.45 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 19.63 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 52.17 (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=	15.22	15.03	14.84	13.91	13.73	12.8	12.8	12.61	13.17	13.73	14.1	14.47	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	67.39	67.2	67.02	66.09	65.9	64.97	64.97	64.78	65.34	65.9	66.27	66.65	

Average = Sum(39)$_{1...12}$ /12= 66.04 (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 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 79.43 (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=	87.37	84.19	81.02	77.84	74.66	71.49	71.49	74.66	77.84	81.02	84.19	87.37	

Total = Sum(44)$_{1...12}$ = 953.14 (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=	129.57	113.32	116.94	101.95	97.82	84.41	78.22	89.76	90.83	105.86	115.55	125.48	

Total = Sum(45)$_{1...12}$ = 1249.72 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.44	17	17.54	15.29	14.67	12.66	11.73	13.46	13.62	15.88	17.33	18.82	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

DER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3: 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	143.63	126.02	131	115.56	111.88	98.02	92.28	103.82	104.44	119.92	129.16	139.54	(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=	143.63	126.02	131	115.56	111.88	98.02	92.28	103.82	104.44	119.92	129.16	139.54	

Output from water heater (annual)$_{1...12}$: 1415.28 (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=	43.08	37.68	38.88	33.9	32.53	28.07	26.01	29.85	30.2	35.2	38.42	41.72	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.81	13.15	10.7	8.1	6.05	5.11	5.52	7.18	9.63	12.23	14.28	15.22	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	166.09	167.81	163.47	154.22	142.55	131.58	124.25	122.53	126.87	136.12	147.79	158.76	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	(71)

Water heating gains (Table 5)

(72)m=	57.91	56.07	52.26	47.08	43.72	38.98	34.96	40.11	41.95	47.31	53.36	56.08	(72)

DER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	298.1	296.34	285.73	268.7	251.62	234.98	224.04	229.12	237.76	254.96	274.73	289.36	(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	2.87	x	10.63	x	0.63	x	0.7	=	18.65	(74)
North	0.9x 0.77	x	2.87	x	20.32	x	0.63	x	0.7	=	35.65	(74)
North	0.9x 0.77	x	2.87	x	34.53	x	0.63	x	0.7	=	60.57	(74)
North	0.9x 0.77	x	2.87	x	55.46	x	0.63	x	0.7	=	97.3	(74)
North	0.9x 0.77	x	2.87	x	74.72	x	0.63	x	0.7	=	131.07	(74)
North	0.9x 0.77	x	2.87	x	79.99	x	0.63	x	0.7	=	140.31	(74)
North	0.9x 0.77	x	2.87	x	74.68	x	0.63	x	0.7	=	131	(74)
North	0.9x 0.77	x	2.87	x	59.25	x	0.63	x	0.7	=	103.93	(74)
North	0.9x 0.77	x	2.87	x	41.52	x	0.63	x	0.7	=	72.83	(74)
North	0.9x 0.77	x	2.87	x	24.19	x	0.63	x	0.7	=	42.43	(74)
North	0.9x 0.77	x	2.87	x	13.12	x	0.63	x	0.7	=	23.01	(74)
North	0.9x 0.77	x	2.87	x	8.86	x	0.63	x	0.7	=	15.55	(74)
Northeast	0.9x 0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(75)
Northeast	0.9x 0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(75)
Northeast	0.9x 0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(75)
Northeast	0.9x 0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(75)
Northeast	0.9x 0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(75)
Northeast	0.9x 0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(75)
Northeast	0.9x 0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(75)
Northeast	0.9x 0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(75)
Northeast	0.9x 0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(75)
Northeast	0.9x 0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(75)
Northeast	0.9x 0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(75)
Northeast	0.9x 0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(75)
South	0.9x 0.77	x	1.1	x	46.75	x	0.63	x	0.7	=	15.72	(78)
South	0.9x 0.77	x	1.51	x	46.75	x	0.63	x	0.7	=	21.57	(78)
South	0.9x 0.77	x	1.1	x	76.57	x	0.63	x	0.7	=	25.74	(78)
South	0.9x 0.77	x	1.51	x	76.57	x	0.63	x	0.7	=	35.33	(78)
South	0.9x 0.77	x	1.1	x	97.53	x	0.63	x	0.7	=	32.79	(78)
South	0.9x 0.77	x	1.51	x	97.53	x	0.63	x	0.7	=	45.01	(78)
South	0.9x 0.77	x	1.1	x	110.23	x	0.63	x	0.7	=	37.06	(78)
South	0.9x 0.77	x	1.51	x	110.23	x	0.63	x	0.7	=	50.87	(78)
South	0.9x 0.77	x	1.1	x	114.87	x	0.63	x	0.7	=	38.62	(78)
South	0.9x 0.77	x	1.51	x	114.87	x	0.63	x	0.7	=	53.01	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.1	x	110.55	x	0.63	x	0.7	=	37.16	(78)
South	0.9x	0.77	x	1.51	x	110.55	x	0.63	x	0.7	=	51.02	(78)
South	0.9x	0.77	x	1.1	x	108.01	x	0.63	x	0.7	=	36.31	(78)
South	0.9x	0.77	x	1.51	x	108.01	x	0.63	x	0.7	=	49.84	(78)
South	0.9x	0.77	x	1.1	x	104.89	x	0.63	x	0.7	=	35.26	(78)
South	0.9x	0.77	x	1.51	x	104.89	x	0.63	x	0.7	=	48.41	(78)
South	0.9x	0.77	x	1.1	x	101.89	x	0.63	x	0.7	=	34.25	(78)
South	0.9x	0.77	x	1.51	x	101.89	x	0.63	x	0.7	=	47.02	(78)
South	0.9x	0.77	x	1.1	x	82.59	x	0.63	x	0.7	=	27.76	(78)
South	0.9x	0.77	x	1.51	x	82.59	x	0.63	x	0.7	=	38.11	(78)
South	0.9x	0.77	x	1.1	x	55.42	x	0.63	x	0.7	=	18.63	(78)
South	0.9x	0.77	x	1.51	x	55.42	x	0.63	x	0.7	=	25.57	(78)
South	0.9x	0.77	x	1.1	x	40.4	x	0.63	x	0.7	=	13.58	(78)
South	0.9x	0.77	x	1.51	x	40.4	x	0.63	x	0.7	=	18.64	(78)
West	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)
West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)
Northwest	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(81)
Northwest	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(81)
Northwest	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(81)
Northwest	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(81)
Northwest	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(81)
Northwest	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(81)
Northwest	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(81)
Northwest	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(81)
Northwest	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(81)
Northwest	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(81)
Northwest	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(81)
Northwest	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	87.29	159.2	245.82	351.7	437.06	452.91	428.74	362.13	282.01	183.49	106.47	73.47	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	385.4	455.53	531.55	620.4	688.69	687.89	652.78	591.25	519.77	438.45	381.2	362.83	(84)

DER WorkSheet: New dwelling design stage

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.93	0.9	0.86	0.77	0.64	0.51	0.39	0.44	0.64	0.82	0.91	0.94	(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=	20.41	20.41	20.42	20.42	20.42	20.43	20.43	20.43	20.43	20.42	20.42	20.42	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.93	0.9	0.85	0.75	0.62	0.47	0.35	0.4	0.61	0.81	0.9	0.94	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.41	20.41	20.42	20.42	20.42	20.43	20.43	20.43	20.43	20.42	20.42	20.42	(90)

fLA = Living area ÷ (4) = | 0.41 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.65	20.65	20.66	20.66	20.66	20.67	20.67	20.67	20.66	20.66	20.66	20.66	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.65	20.65	20.66	20.66	20.66	20.67	20.67	20.67	20.66	20.66	20.66	20.66	(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=	0.93	0.9	0.85	0.76	0.63	0.49	0.37	0.42	0.62	0.81	0.9	0.94	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	358.41	410.4	452.05	470.64	435.05	334.66	241.39	246.19	321.6	356.16	344.85	340.12	(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=	1102.04	1058.74	948.64	777.17	590.53	394.08	264.14	276.4	428.89	663.02	898.59	1096.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	553.26	435.68	369.46	220.7	115.68	0	0	0	0	228.3	398.7	562.96	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = | 2884.74 | (98)

Space heating requirement in kWh/m²/year | 50.34 | (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 | 510.77 | (206)

Efficiency of secondary/supplementary heating system, % | 100 | (208)

DER WorkSheet: New dwelling design stage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	553.26	435.68	369.46	220.7	115.68	0	0	0	0	228.3	398.7	562.96	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	108.32	85.3	72.33	43.21	22.65	0	0	0	0	44.7	78.06	110.22	
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													564.79 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	143.63	126.02	131	115.56	111.88	98.02	92.28	103.82	104.44	119.92	129.16	139.54	
Efficiency of water heater													194.18 (216)
(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	73.97	64.9	67.46	59.51	57.62	50.48	47.52	53.47	53.79	61.76	66.52	71.86	
Total = Sum(219a)$_{1...12}$ =													728.85 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		564.79
Water heating fuel used		728.85
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	149.42	(230a)
warm air heating system fans	77.35	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		226.78 (231)
Electricity for lighting		261.5 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1781.91 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year
Space heating (main system 1)	(211) x	0.519 =	293.12 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.519 =	378.27 (264)
Space and water heating	(261) + (262) + (263) + (264) =		671.4 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	117.7 (267)
Electricity for lighting	(232) x	0.519 =	135.72 (268)
Total CO2, kg/year	sum of (265)…(271) =		924.81 (272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =		16.14 (273)
EI rating (section 14)			88 (274)

DER WorkSheet: New dwelling design stage

Predicted Energy Assessment

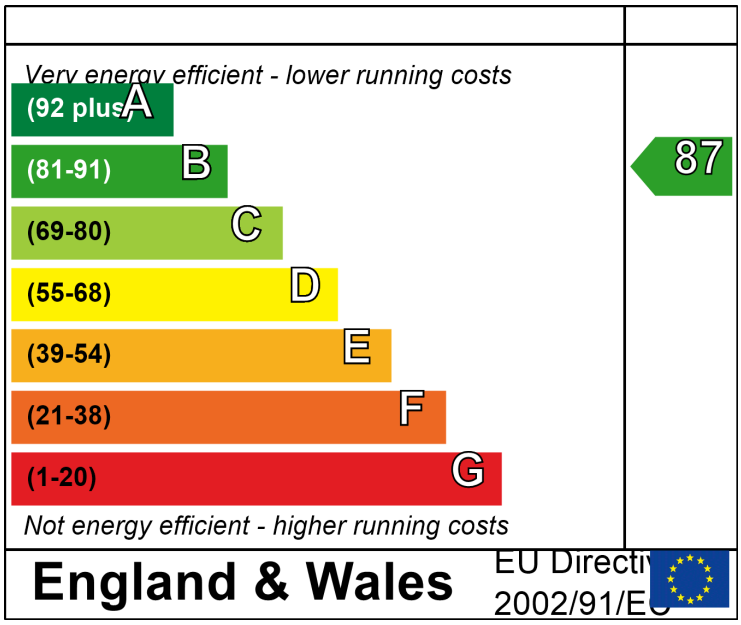
FLAT 09
43 London Street
Reading
RG1 4PS

Dwelling type: Top floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 57.3 m²

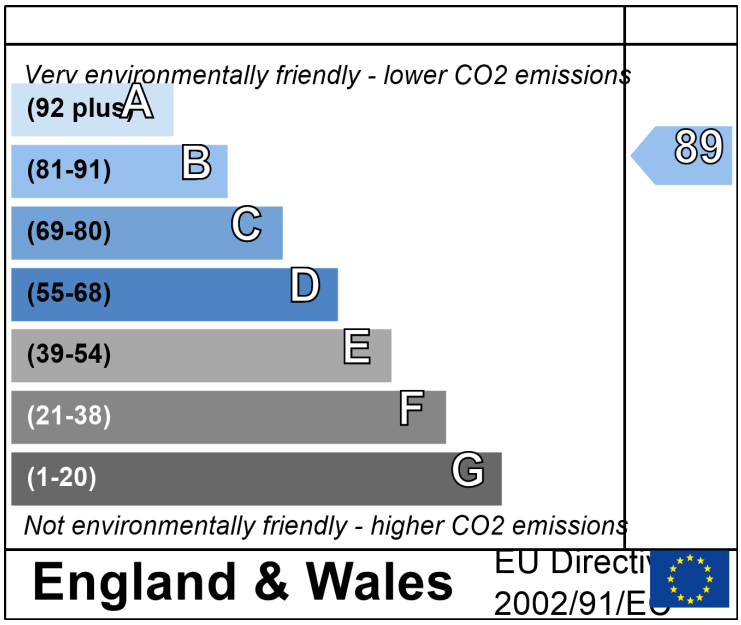
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 09

Address : FLAT 09, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	57.3	(1a) x	2.25	(2a) =	128.92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	57.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		128.92	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			2.81	x1/[1/(1.1)+ 0.04]		=	2.96			(27)
Windows Type 2			1.1	x1/[1/(1.1)+ 0.04]		=	1.16			(27)
Windows Type 3			2.87	x1/[1/(1.1)+ 0.04]		=	3.02			(27)
Windows Type 4			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 5			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 6			1.51	x1/[1/(1.1)+ 0.04]		=	1.59			(27)
Walls Type1	12.48	2.1	10.38	x	0.19	=	1.97	14	145.32	(29)
Walls Type2	20.56	0	20.56	x	0.16	=	3.29	14	287.84	(29)
Walls Type3	31.24	13.85	17.39	x	0.12	=	2.09	14	243.46	(29)
Walls Type4	8.58	1.51	7.07	x	0.12	=	0.85	14	98.98	(29)
Roof Type1	34.8	0	34.8	x	0.11	=	3.83	9	313.2	(30)
Roof Type2	23.2	0	23.2	x	0.11	=	2.55	9	208.8	(30)
Total area of elements, m²			130.86							(31)
Party wall			3.15	x	0	=	0	20	63	(32)
Party floor			57.3					30	1719	(32a)
Internal wall **			125.44					9	1128.96	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.55 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4208.56 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 73.45 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 19.63 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 52.17 (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=	15.22	15.03	14.84	13.91	13.73	12.8	12.8	12.61	13.17	13.73	14.1	14.47	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	67.39	67.2	67.02	66.09	65.9	64.97	64.97	64.78	65.34	65.9	66.27	66.65	

Average = Sum(39)$_{1...12}$ /12= 66.04 (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 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 79.43 (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=	87.37	84.19	81.02	77.84	74.66	71.49	71.49	74.66	77.84	81.02	84.19	87.37	

Total = Sum(44)$_{1...12}$ = 953.14 (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=	129.57	113.32	116.94	101.95	97.82	84.41	78.22	89.76	90.83	105.86	115.55	125.48	

Total = Sum(45)$_{1...12}$ = 1249.72 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.44	17	17.54	15.29	14.67	12.66	11.73	13.46	13.62	15.88	17.33	18.82	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

SAP WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	143.63	126.02	131	115.56	111.88	98.02	92.28	103.82	104.44	119.92	129.16	139.54	(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=	143.63	126.02	131	115.56	111.88	98.02	92.28	103.82	104.44	119.92	129.16	139.54	

Output from water heater (annual)$_{1...12}$ 1415.28 (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=	43.08	37.68	38.88	33.9	32.53	28.07	26.01	29.85	30.2	35.2	38.42	41.72	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	114.26	114.26	114.26	114.26	114.26	114.26	114.26	114.26	114.26	114.26	114.26	114.26	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	37.02	32.88	26.74	20.24	15.13	12.77	13.8	17.94	24.08	30.58	35.69	38.05	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	247.9	250.47	243.99	230.19	212.77	196.39	185.45	182.88	189.36	203.16	220.59	236.96	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48.33	48.33	48.33	48.33	48.33	48.33	48.33	48.33	48.33	48.33	48.33	48.33	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	(71)

Water heating gains (Table 5)

(72)m=	57.91	56.07	52.26	47.08	43.72	38.98	34.96	40.11	41.95	47.31	53.36	56.08	(72)

SAP WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	436.97	433.57	417.14	391.66	365.77	342.3	328.37	335.09	349.55	375.2	403.79	425.24

(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)	
North	0.9x	1	x	2.87	x	10.63	x	0.63	x	0.7	=	24.23 (74)
North	0.9x	1	x	2.87	x	20.32	x	0.63	x	0.7	=	46.3 (74)
North	0.9x	1	x	2.87	x	34.53	x	0.63	x	0.7	=	78.67 (74)
North	0.9x	1	x	2.87	x	55.46	x	0.63	x	0.7	=	126.36 (74)
North	0.9x	1	x	2.87	x	74.72	x	0.63	x	0.7	=	170.22 (74)
North	0.9x	1	x	2.87	x	79.99	x	0.63	x	0.7	=	182.22 (74)
North	0.9x	1	x	2.87	x	74.68	x	0.63	x	0.7	=	170.13 (74)
North	0.9x	1	x	2.87	x	59.25	x	0.63	x	0.7	=	134.98 (74)
North	0.9x	1	x	2.87	x	41.52	x	0.63	x	0.7	=	94.58 (74)
North	0.9x	1	x	2.87	x	24.19	x	0.63	x	0.7	=	55.11 (74)
North	0.9x	1	x	2.87	x	13.12	x	0.63	x	0.7	=	29.88 (74)
North	0.9x	1	x	2.87	x	8.86	x	0.63	x	0.7	=	20.2 (74)
Northeast	0.9x	1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4 (75)
Northeast	0.9x	1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14 (75)
Northeast	0.9x	1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49 (75)
Northeast	0.9x	1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64 (75)
Northeast	0.9x	1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14 (75)
Northeast	0.9x	1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17 (75)
Northeast	0.9x	1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93 (75)
Northeast	0.9x	1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53 (75)
Northeast	0.9x	1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03 (75)
Northeast	0.9x	1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39 (75)
Northeast	0.9x	1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83 (75)
Northeast	0.9x	1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68 (75)
South	0.9x	1	x	1.1	x	46.75	x	0.63	x	0.7	=	20.41 (78)
South	0.9x	1	x	1.51	x	46.75	x	0.63	x	0.7	=	28.02 (78)
South	0.9x	1	x	1.1	x	76.57	x	0.63	x	0.7	=	33.43 (78)
South	0.9x	1	x	1.51	x	76.57	x	0.63	x	0.7	=	45.89 (78)
South	0.9x	1	x	1.1	x	97.53	x	0.63	x	0.7	=	42.58 (78)
South	0.9x	1	x	1.51	x	97.53	x	0.63	x	0.7	=	58.45 (78)
South	0.9x	1	x	1.1	x	110.23	x	0.63	x	0.7	=	48.13 (78)
South	0.9x	1	x	1.51	x	110.23	x	0.63	x	0.7	=	66.07 (78)
South	0.9x	1	x	1.1	x	114.87	x	0.63	x	0.7	=	50.15 (78)
South	0.9x	1	x	1.51	x	114.87	x	0.63	x	0.7	=	68.84 (78)

SAP WorkSheet: New dwelling design stage

South	0.9x	1	x	1.1	x	110.55	x	0.63	x	0.7	=	48.26	(78)
South	0.9x	1	x	1.51	x	110.55	x	0.63	x	0.7	=	66.25	(78)
South	0.9x	1	x	1.1	x	108.01	x	0.63	x	0.7	=	47.16	(78)
South	0.9x	1	x	1.51	x	108.01	x	0.63	x	0.7	=	64.73	(78)
South	0.9x	1	x	1.1	x	104.89	x	0.63	x	0.7	=	45.8	(78)
South	0.9x	1	x	1.51	x	104.89	x	0.63	x	0.7	=	62.87	(78)
South	0.9x	1	x	1.1	x	101.89	x	0.63	x	0.7	=	44.48	(78)
South	0.9x	1	x	1.51	x	101.89	x	0.63	x	0.7	=	61.06	(78)
South	0.9x	1	x	1.1	x	82.59	x	0.63	x	0.7	=	36.06	(78)
South	0.9x	1	x	1.51	x	82.59	x	0.63	x	0.7	=	49.5	(78)
South	0.9x	1	x	1.1	x	55.42	x	0.63	x	0.7	=	24.19	(78)
South	0.9x	1	x	1.51	x	55.42	x	0.63	x	0.7	=	33.21	(78)
South	0.9x	1	x	1.1	x	40.4	x	0.63	x	0.7	=	17.64	(78)
South	0.9x	1	x	1.51	x	40.4	x	0.63	x	0.7	=	24.21	(78)
West	0.9x	1	x	2.81	x	19.64	x	0.63	x	0.7	=	21.9	(80)
West	0.9x	1	x	2.81	x	38.42	x	0.63	x	0.7	=	42.85	(80)
West	0.9x	1	x	2.81	x	63.27	x	0.63	x	0.7	=	70.57	(80)
West	0.9x	1	x	2.81	x	92.28	x	0.63	x	0.7	=	102.92	(80)
West	0.9x	1	x	2.81	x	113.09	x	0.63	x	0.7	=	126.13	(80)
West	0.9x	1	x	2.81	x	115.77	x	0.63	x	0.7	=	129.12	(80)
West	0.9x	1	x	2.81	x	110.22	x	0.63	x	0.7	=	122.93	(80)
West	0.9x	1	x	2.81	x	94.68	x	0.63	x	0.7	=	105.59	(80)
West	0.9x	1	x	2.81	x	73.59	x	0.63	x	0.7	=	82.07	(80)
West	0.9x	1	x	2.81	x	45.59	x	0.63	x	0.7	=	50.85	(80)
West	0.9x	1	x	2.81	x	24.49	x	0.63	x	0.7	=	27.31	(80)
West	0.9x	1	x	2.81	x	16.15	x	0.63	x	0.7	=	18.01	(80)
Northwest	0.9x	1	x	2.1	x	11.28	x	0.63	x	0.7	=	9.4	(81)
Northwest	0.9x	1	x	2.1	x	22.97	x	0.63	x	0.7	=	19.14	(81)
Northwest	0.9x	1	x	2.1	x	41.38	x	0.63	x	0.7	=	34.49	(81)
Northwest	0.9x	1	x	2.1	x	67.96	x	0.63	x	0.7	=	56.64	(81)
Northwest	0.9x	1	x	2.1	x	91.35	x	0.63	x	0.7	=	76.14	(81)
Northwest	0.9x	1	x	2.1	x	97.38	x	0.63	x	0.7	=	81.17	(81)
Northwest	0.9x	1	x	2.1	x	91.1	x	0.63	x	0.7	=	75.93	(81)
Northwest	0.9x	1	x	2.1	x	72.63	x	0.63	x	0.7	=	60.53	(81)
Northwest	0.9x	1	x	2.1	x	50.42	x	0.63	x	0.7	=	42.03	(81)
Northwest	0.9x	1	x	2.1	x	28.07	x	0.63	x	0.7	=	23.39	(81)
Northwest	0.9x	1	x	2.1	x	14.2	x	0.63	x	0.7	=	11.83	(81)
Northwest	0.9x	1	x	2.1	x	9.21	x	0.63	x	0.7	=	7.68	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	113.37	206.75	319.25	456.75	567.62	588.2	556.81	470.3	366.25	238.29	138.27	95.42

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	550.34	640.32	736.39	848.41	933.38	930.5	885.18	805.39	715.8	613.5	542.06	520.65

(84)

SAP WorkSheet: New dwelling design stage

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.88	0.84	0.77	0.66	0.53	0.4	0.3	0.34	0.52	0.72	0.84	0.89	(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=	20.41	20.41	20.42	20.42	20.42	20.43	20.43	20.43	20.43	20.42	20.42	20.42	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.87	0.83	0.76	0.65	0.51	0.37	0.27	0.31	0.49	0.7	0.83	0.88	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.41	20.41	20.42	20.42	20.42	20.43	20.43	20.43	20.43	20.42	20.42	20.42	(90)

fLA = Living area ÷ (4) = | 0.41 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.65	20.65	20.66	20.66	20.66	20.67	20.67	20.67	20.66	20.66	20.66	20.66	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.65	20.65	20.66	20.66	20.66	20.67	20.67	20.67	20.66	20.66	20.66	20.66	(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=	0.87	0.83	0.77	0.65	0.52	0.38	0.28	0.32	0.5	0.71	0.83	0.88	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	480.96	532.99	563.54	555.65	486.41	357.41	250.9	258.62	359.44	436.79	452.47	460.67	(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=	1102.04	1058.74	948.64	777.17	590.53	394.08	264.14	276.4	428.89	663.02	898.59	1096.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	462.09	353.3	286.52	159.5	77.46	0	0	0	0	168.31	321.21	473.27	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = | 2301.65 | (98)

Space heating requirement in kWh/m²/year | 40.17 | (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 | 510.77 | (206)

Efficiency of secondary/supplementary heating system, % | 100 | (208)

SAP WorkSheet: New dwelling design stage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	462.09	353.3	286.52	159.5	77.46	0	0	0	0	168.31	321.21	473.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	90.47	69.17	56.1	31.23	15.17	0	0	0	0	32.95	62.89	92.66	

(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 450.63 (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)	143.63	126.02	131	115.56	111.88	98.02	92.28	103.82	104.44	119.92	129.16	139.54	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	73.97	64.9	67.46	59.51	57.62	50.48	47.52	53.47	53.79	61.76	66.52	71.86	

Total = Sum(219a)$_{1...12}$ = 728.85 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		450.63	
Water heating fuel used		728.85	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	149.42		(230a)
warm air heating system fans	77.35		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		226.78	(231)
Electricity for lighting		261.5	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1667.75	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year	
Space heating - main system 1	(211) x	13.19 x 0.01 =	59.44	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	13.19 x 0.01 =	96.14	(247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	29.91	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a)				
Energy for lighting	(232)	13.19 x 0.01 =	34.49	(250)
Additional standing charges (Table 12)			0	(251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)…(254) = 219.98 (255)

SAP WorkSheet: New dwelling design stage

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.9	(257)
SAP rating (Section 12)		87.4	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	233.88	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	378.27	(264)
Space and water heating	(261) + (262) + (263) + (264) =			612.15	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	117.7	(267)
Electricity for lighting	(232) x	0.519	=	135.72	(268)
Total CO2, kg/year	sum of (265)…(271) =			865.56	(272)
CO2 emissions per m²	(272) ÷ (4) =			15.11	(273)
EI rating (section 14)				89	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	1383.42	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	2237.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3621	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	696.21	(267)
Electricity for lighting	(232) x	0	=	802.8	(268)
'Total Primary Energy	sum of (265)…(271) =			5120.01	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			89.35	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 09

Address : FLAT 09, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	57.3 (1a)	x	2.25 (2a)	=	128.92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	57.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.92	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.16	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.35	0.35	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33

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=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			2.24	x1/[1/(1.4)+ 0.04]		=	2.97			(27)
Windows Type 2			0.88	x1/[1/(1.4)+ 0.04]		=	1.17			(27)
Windows Type 3			2.28	x1/[1/(1.4)+ 0.04]		=	3.02			(27)
Windows Type 4			1.67	x1/[1/(1.4)+ 0.04]		=	2.21			(27)
Windows Type 5			1.67	x1/[1/(1.4)+ 0.04]		=	2.21			(27)
Windows Type 6			1.2	x1/[1/(1.4)+ 0.04]		=	1.59			(27)
Walls Type1	12.48	2.1	10.38	x	0.18	=	1.87			(29)
Walls Type2	20.56	0	20.56	x	0.18	=	3.7			(29)
Walls Type3	31.24	11.02	20.22	x	0.18	=	3.64			(29)
Walls Type4	8.58	1.2	7.38	x	0.18	=	1.33			(29)
Roof Type1	34.8	0	34.8	x	0.13	=	4.52			(30)
Roof Type2	23.2	0	23.2	x	0.13	=	3.02			(30)
Total area of elements, m²			130.86							(31)
Party wall			3.15	x	0	=	0			(32)
Party floor			57.3							(32a)
Internal wall **			125.44							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 36.38 (33)

TER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4252.52 (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 6.54 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 42.92 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	24.05	23.95	23.84	23.34	23.25	22.82	22.82	22.74	22.98	23.25	23.44	23.63	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	66.97	66.87	66.76	66.26	66.17	65.74	65.74	65.66	65.9	66.17	66.36	66.56	

Average = Sum(39)$_{1...12}$ /12= 66.26 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.17	1.17	1.17	1.16	1.15	1.15	1.15	1.15	1.15	1.15	1.16	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.16 (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 79.43 (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=	87.37	84.19	81.02	77.84	74.66	71.49	71.49	74.66	77.84	81.02	84.19	87.37	

Total = Sum(44)$_{1...12}$ = 953.14 (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=	129.57	113.32	116.94	101.95	97.82	84.41	78.22	89.76	90.83	105.86	115.55	125.48	

Total = Sum(45)$_{1...12}$ = 1249.72 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.44	17	17.54	15.29	14.67	12.66	11.73	13.46	13.62	15.88	17.33	18.82	(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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (50)

b) If manufacturer's declared cylinder loss factor is not known:

TER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	178.81	157.8	166.18	149.6	147.07	132.07	127.46	139	138.49	155.1	163.21	174.72	(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=	178.81	157.8	166.18	149.6	147.07	132.07	127.46	139	138.49	155.1	163.21	174.72	

Output from water heater (annual)$_{1...12}$ — 1829.51 — (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	82.48	73.26	78.28	72.02	71.92	66.19	65.4	69.24	68.33	74.59	76.54	81.12	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	95.22	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.83	13.17	10.71	8.11	6.06	5.12	5.53	7.19	9.65	12.25	14.3	15.25	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	166.09	167.81	163.47	154.22	142.55	131.58	124.25	122.53	126.87	136.12	147.79	158.76	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	32.52	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	-76.17	(71)

Water heating gains (Table 5)

(72)m=	110.85	109.02	105.21	100.03	96.67	91.93	87.91	93.06	94.9	100.26	106.31	109.03	(72)

TER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	346.34	344.57	333.96	316.93	299.85	283.2	272.26	277.35	285.99	303.2	322.97	337.6	(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	2.28	x	10.63	x	0.63	x	0.7	=	14.82	(74)
North	0.9x 0.77	x	2.28	x	20.32	x	0.63	x	0.7	=	28.32	(74)
North	0.9x 0.77	x	2.28	x	34.53	x	0.63	x	0.7	=	48.12	(74)
North	0.9x 0.77	x	2.28	x	55.46	x	0.63	x	0.7	=	77.29	(74)
North	0.9x 0.77	x	2.28	x	74.72	x	0.63	x	0.7	=	104.12	(74)
North	0.9x 0.77	x	2.28	x	79.99	x	0.63	x	0.7	=	111.47	(74)
North	0.9x 0.77	x	2.28	x	74.68	x	0.63	x	0.7	=	104.07	(74)
North	0.9x 0.77	x	2.28	x	59.25	x	0.63	x	0.7	=	82.57	(74)
North	0.9x 0.77	x	2.28	x	41.52	x	0.63	x	0.7	=	57.86	(74)
North	0.9x 0.77	x	2.28	x	24.19	x	0.63	x	0.7	=	33.71	(74)
North	0.9x 0.77	x	2.28	x	13.12	x	0.63	x	0.7	=	18.28	(74)
North	0.9x 0.77	x	2.28	x	8.86	x	0.63	x	0.7	=	12.35	(74)
Northeast	0.9x 0.77	x	1.67	x	11.28	x	0.63	x	0.7	=	5.76	(75)
Northeast	0.9x 0.77	x	1.67	x	22.97	x	0.63	x	0.7	=	11.72	(75)
Northeast	0.9x 0.77	x	1.67	x	41.38	x	0.63	x	0.7	=	21.12	(75)
Northeast	0.9x 0.77	x	1.67	x	67.96	x	0.63	x	0.7	=	34.68	(75)
Northeast	0.9x 0.77	x	1.67	x	91.35	x	0.63	x	0.7	=	46.62	(75)
Northeast	0.9x 0.77	x	1.67	x	97.38	x	0.63	x	0.7	=	49.7	(75)
Northeast	0.9x 0.77	x	1.67	x	91.1	x	0.63	x	0.7	=	46.5	(75)
Northeast	0.9x 0.77	x	1.67	x	72.63	x	0.63	x	0.7	=	37.07	(75)
Northeast	0.9x 0.77	x	1.67	x	50.42	x	0.63	x	0.7	=	25.73	(75)
Northeast	0.9x 0.77	x	1.67	x	28.07	x	0.63	x	0.7	=	14.32	(75)
Northeast	0.9x 0.77	x	1.67	x	14.2	x	0.63	x	0.7	=	7.25	(75)
Northeast	0.9x 0.77	x	1.67	x	9.21	x	0.63	x	0.7	=	4.7	(75)
South	0.9x 0.77	x	0.88	x	46.75	x	0.63	x	0.7	=	12.57	(78)
South	0.9x 0.77	x	1.2	x	46.75	x	0.63	x	0.7	=	17.15	(78)
South	0.9x 0.77	x	0.88	x	76.57	x	0.63	x	0.7	=	20.59	(78)
South	0.9x 0.77	x	1.2	x	76.57	x	0.63	x	0.7	=	28.08	(78)
South	0.9x 0.77	x	0.88	x	97.53	x	0.63	x	0.7	=	26.23	(78)
South	0.9x 0.77	x	1.2	x	97.53	x	0.63	x	0.7	=	35.77	(78)
South	0.9x 0.77	x	0.88	x	110.23	x	0.63	x	0.7	=	29.65	(78)
South	0.9x 0.77	x	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)
South	0.9x 0.77	x	0.88	x	114.87	x	0.63	x	0.7	=	30.89	(78)
South	0.9x 0.77	x	1.2	x	114.87	x	0.63	x	0.7	=	42.13	(78)

TER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	0.88	x	110.55	x	0.63	x	0.7	=	29.73	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	x	0.7	=	40.54	(78)
South	0.9x	0.77	x	0.88	x	108.01	x	0.63	x	0.7	=	29.05	(78)
South	0.9x	0.77	x	1.2	x	108.01	x	0.63	x	0.7	=	39.61	(78)
South	0.9x	0.77	x	0.88	x	104.89	x	0.63	x	0.7	=	28.21	(78)
South	0.9x	0.77	x	1.2	x	104.89	x	0.63	x	0.7	=	38.47	(78)
South	0.9x	0.77	x	0.88	x	101.89	x	0.63	x	0.7	=	27.4	(78)
South	0.9x	0.77	x	1.2	x	101.89	x	0.63	x	0.7	=	37.37	(78)
South	0.9x	0.77	x	0.88	x	82.59	x	0.63	x	0.7	=	22.21	(78)
South	0.9x	0.77	x	1.2	x	82.59	x	0.63	x	0.7	=	30.29	(78)
South	0.9x	0.77	x	0.88	x	55.42	x	0.63	x	0.7	=	14.9	(78)
South	0.9x	0.77	x	1.2	x	55.42	x	0.63	x	0.7	=	20.32	(78)
South	0.9x	0.77	x	0.88	x	40.4	x	0.63	x	0.7	=	10.86	(78)
South	0.9x	0.77	x	1.2	x	40.4	x	0.63	x	0.7	=	14.82	(78)
West	0.9x	0.77	x	2.24	x	19.64	x	0.63	x	0.7	=	13.45	(80)
West	0.9x	0.77	x	2.24	x	38.42	x	0.63	x	0.7	=	26.3	(80)
West	0.9x	0.77	x	2.24	x	63.27	x	0.63	x	0.7	=	43.32	(80)
West	0.9x	0.77	x	2.24	x	92.28	x	0.63	x	0.7	=	63.17	(80)
West	0.9x	0.77	x	2.24	x	113.09	x	0.63	x	0.7	=	77.42	(80)
West	0.9x	0.77	x	2.24	x	115.77	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.24	x	110.22	x	0.63	x	0.7	=	75.45	(80)
West	0.9x	0.77	x	2.24	x	94.68	x	0.63	x	0.7	=	64.81	(80)
West	0.9x	0.77	x	2.24	x	73.59	x	0.63	x	0.7	=	50.38	(80)
West	0.9x	0.77	x	2.24	x	45.59	x	0.63	x	0.7	=	31.21	(80)
West	0.9x	0.77	x	2.24	x	24.49	x	0.63	x	0.7	=	16.76	(80)
West	0.9x	0.77	x	2.24	x	16.15	x	0.63	x	0.7	=	11.06	(80)
Northwest	0.9x	0.77	x	1.67	x	11.28	x	0.63	x	0.7	=	5.76	(81)
Northwest	0.9x	0.77	x	1.67	x	22.97	x	0.63	x	0.7	=	11.72	(81)
Northwest	0.9x	0.77	x	1.67	x	41.38	x	0.63	x	0.7	=	21.12	(81)
Northwest	0.9x	0.77	x	1.67	x	67.96	x	0.63	x	0.7	=	34.68	(81)
Northwest	0.9x	0.77	x	1.67	x	91.35	x	0.63	x	0.7	=	46.62	(81)
Northwest	0.9x	0.77	x	1.67	x	97.38	x	0.63	x	0.7	=	49.7	(81)
Northwest	0.9x	0.77	x	1.67	x	91.1	x	0.63	x	0.7	=	46.5	(81)
Northwest	0.9x	0.77	x	1.67	x	72.63	x	0.63	x	0.7	=	37.07	(81)
Northwest	0.9x	0.77	x	1.67	x	50.42	x	0.63	x	0.7	=	25.73	(81)
Northwest	0.9x	0.77	x	1.67	x	28.07	x	0.63	x	0.7	=	14.32	(81)
Northwest	0.9x	0.77	x	1.67	x	14.2	x	0.63	x	0.7	=	7.25	(81)
Northwest	0.9x	0.77	x	1.67	x	9.21	x	0.63	x	0.7	=	4.7	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	69.5	126.74	195.67	279.91	347.81	360.4	341.17	288.19	224.47	146.07	84.76	58.5	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	415.84	471.31	529.63	596.84	647.65	643.6	613.43	565.54	510.45	449.26	407.73	396.1	(84)

TER WorkSheet: New dwelling design stage

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.93	0.81	0.62	0.47	0.52	0.78	0.96	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.85	20	20.26	20.6	20.85	20.97	20.99	20.99	20.91	20.58	20.15	19.82	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.95	19.95	19.95	19.96	19.96	19.96	19.96	19.96	19.96	19.96	19.95	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.97	0.91	0.76	0.54	0.36	0.41	0.7	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=	18.43	18.65	19.03	19.5	19.82	19.94	19.96	19.96	19.89	19.48	18.87	18.38	(90)

fLA = Living area ÷ (4) = | 0.41 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.01	19.21	19.53	19.95	20.24	20.36	20.38	20.38	20.31	19.93	19.4	18.97	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.01	19.21	19.53	19.95	20.24	20.36	20.38	20.38	20.31	19.93	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

	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	0.91	0.77	0.57	0.4	0.46	0.73	0.93	0.98	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	412.49	464.1	511.14	540.65	500.17	367.65	247.2	258.56	372.9	420.04	401.27	393.54	(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=	985.21	956.65	870.18	731.99	565.33	378.93	248.78	261.46	409.21	617.32	816.05	983.12	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	426.1	330.99	267.12	137.76	48.48	0	0	0	0	146.78	298.65	438.65	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = | 2094.53 | (98)

Space heating requirement in kWh/m²/year | 36.55 | (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system | 0 | (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = | 1 | (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = | 1 | (204)

Efficiency of main space heating system 1 | 93.5 | (206)

Efficiency of secondary/supplementary heating system, % | 0 | (208)

TER WorkSheet: New dwelling design stage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	426.1	330.99	267.12	137.76	48.48	0	0	0	0	146.78	298.65	438.65	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	455.73	354	285.69	147.34	51.85	0	0	0	0	156.99	319.41	469.14	
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													2240.14 (211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)													
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0 (215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	178.81	157.8	166.18	149.6	147.07	132.07	127.46	139	138.49	155.1	163.21	174.72	
Efficiency of water heater													79.8 (216)
(217)m=	87.05	86.75	86.07	84.59	82.21	79.8	79.8	79.8	79.8	84.67	86.41	87.17	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	205.41	181.91	193.07	176.85	178.89	165.5	159.73	174.19	173.54	183.19	188.88	200.44	
Total = Sum(219a)$_{1...12}$ =													2181.6 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2240.14	
Water heating fuel used		2181.6	
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		261.95	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4758.7	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	483.87	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	471.23	(264)
Space and water heating	(261) + (262) + (263) + (264) =				955.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	135.95	(268)
Total CO2, kg/year	sum of (265)…(271) =				1129.98	(272)

TER = 28.89 (273)

TER WorkSheet: New dwelling design stage

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:06

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 68.2m²

Site Reference : 43LS **Plot Reference:** FLAT 10

Address : FLAT 10, 43 London Street, Reading, RG1 4PS

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)	27.49 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.51 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.19 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.04 (max. 2.00)	1.30 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.76	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Very Little
Windows facing: East	2.87m²
Windows facing: North	3.5m²
Windows facing: North	4.29m²
Windows facing: North	1.71m²
Windows facing: South	1.73m²
Windows facing: East	5.54m²
Roof windows facing: South	1.63m²
Ventilation rate:	4.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.85 W/m²K
Roofs U-value	0.11 W/m²K
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 10

Address : FLAT 10, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	68.2	(1a) x	2.25	(2a) =	153.45	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	68.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		153.45	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 2			1.75	x	1/[1/(1.1)+ 0.04]	=	1.84			(27)
Windows Type 3			4.29	x	1/[1/(1.1)+ 0.04]	=	4.52			(27)
Windows Type 4			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 5			1.73	x	1/[1/(0.92)+ 0.04]	=	1.54			(27)
Windows Type 6			5.54	x	1/[1/(0.92)+ 0.04]	=	4.92			(27)
Rooflights			1.632	x	1/[1/(1.3) + 0.04]	=	2.1216			(27b)
Walls Type1	17.98	2.1	15.88	x	0.19	=	3.02	14	222.32	(29)
Walls Type2	24.32	0	24.32	x	0.16	=	3.89	14	340.48	(29)
Walls Type3	45.38	19.64	25.74	x	0.12	=	3.09	14	360.29	(29)
Roof Type1	38.8	0	38.8	x	0.11	=	4.27	9	349.2	(30)
Roof Type2	30.3	1.63	28.67	x	0.11	=	3.15	9	258.01	(30)
Total area of elements, m²			156.77							(31)
Party wall			3.15	x	0	=	0	20	63	(32)
Party floor			68.2					30	2046	(32a)
Internal wall **			132.21					9	1189.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 40.7 (33)

DER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4829.19 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 70.81 (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 23.52 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 64.22 (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=	18.11	17.89	17.67	16.56	16.34	15.23	15.23	15.01	15.67	16.34	16.78	17.22	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	82.33	82.11	81.89	80.78	80.56	79.45	79.45	79.23	79.89	80.56	81	81.44	

Average = Sum(39)$_{1...12}$ /12= 80.72 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.21	1.2	1.2	1.18	1.18	1.16	1.16	1.16	1.17	1.18	1.19	1.19	

Average = Sum(40)$_{1...12}$ /12= 1.18 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.2 (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 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

DER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	155.15	136.1	141.39	124.62	120.58	105.53	99.24	111.8	112.51	129.33	139.43	150.7	(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=	155.15	136.1	141.39	124.62	120.58	105.53	99.24	111.8	112.51	129.33	139.43	150.7	

Output from water heater (annual)$_{1...12}$ 1526.37 (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=	46.91	41.03	42.34	36.91	35.42	30.56	28.32	32.5	32.89	38.33	41.84	45.43	(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=	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	(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=	63.05	61.06	56.91	51.27	47.6	42.45	38.07	43.68	45.68	51.51	58.11	61.06	(72)

DER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	338.56	336.64	324.59	305.18	285.57	266.57	254.15	259.68	269.58	289.19	311.72	328.53	(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	=	11.37	(74)
North	0.9x 0.77	x	4.29	x	10.63	x	0.63	x	0.7	=	13.94	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	1.75	x	20.32	x	0.63	x	0.7	=	21.74	(74)
North	0.9x 0.77	x	4.29	x	20.32	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	1.75	x	34.53	x	0.63	x	0.7	=	36.94	(74)
North	0.9x 0.77	x	4.29	x	34.53	x	0.63	x	0.7	=	45.27	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	1.75	x	55.46	x	0.63	x	0.7	=	59.33	(74)
North	0.9x 0.77	x	4.29	x	55.46	x	0.63	x	0.7	=	72.72	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	1.75	x	74.72	x	0.63	x	0.7	=	79.92	(74)
North	0.9x 0.77	x	4.29	x	74.72	x	0.63	x	0.7	=	97.96	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	1.75	x	79.99	x	0.63	x	0.7	=	85.56	(74)
North	0.9x 0.77	x	4.29	x	79.99	x	0.63	x	0.7	=	104.87	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	1.75	x	74.68	x	0.63	x	0.7	=	79.88	(74)
North	0.9x 0.77	x	4.29	x	74.68	x	0.63	x	0.7	=	97.91	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	1.75	x	59.25	x	0.63	x	0.7	=	63.37	(74)
North	0.9x 0.77	x	4.29	x	59.25	x	0.63	x	0.7	=	77.68	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	1.75	x	41.52	x	0.63	x	0.7	=	44.41	(74)
North	0.9x 0.77	x	4.29	x	41.52	x	0.63	x	0.7	=	54.43	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	1.75	x	24.19	x	0.63	x	0.7	=	25.87	(74)
North	0.9x 0.77	x	4.29	x	24.19	x	0.63	x	0.7	=	31.71	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	1.75	x	13.12	x	0.63	x	0.7	=	14.03	(74)
North	0.9x 0.77	x	4.29	x	13.12	x	0.63	x	0.7	=	17.2	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	1.75	x	8.86	x	0.63	x	0.7	=	9.48	(74)

DER WorkSheet: New dwelling design stage

North	0.9x	0.77	x	4.29	x	8.86	x	0.63	x	0.7	=	11.62	(74)
North	0.9x	0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x	0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(76)
East	0.9x	0.77	x	5.54	x	19.64	x	0.51	x	0.8	=	30.76	(76)
East	0.9x	0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(76)
East	0.9x	0.77	x	5.54	x	38.42	x	0.51	x	0.8	=	60.18	(76)
East	0.9x	0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(76)
East	0.9x	0.77	x	5.54	x	63.27	x	0.51	x	0.8	=	99.11	(76)
East	0.9x	0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(76)
East	0.9x	0.77	x	5.54	x	92.28	x	0.51	x	0.8	=	144.55	(76)
East	0.9x	0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(76)
East	0.9x	0.77	x	5.54	x	113.09	x	0.51	x	0.8	=	177.15	(76)
East	0.9x	0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(76)
East	0.9x	0.77	x	5.54	x	115.77	x	0.51	x	0.8	=	181.34	(76)
East	0.9x	0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(76)
East	0.9x	0.77	x	5.54	x	110.22	x	0.51	x	0.8	=	172.65	(76)
East	0.9x	0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(76)
East	0.9x	0.77	x	5.54	x	94.68	x	0.51	x	0.8	=	148.3	(76)
East	0.9x	0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(76)
East	0.9x	0.77	x	5.54	x	73.59	x	0.51	x	0.8	=	115.27	(76)
East	0.9x	0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(76)
East	0.9x	0.77	x	5.54	x	45.59	x	0.51	x	0.8	=	71.41	(76)
East	0.9x	0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(76)
East	0.9x	0.77	x	5.54	x	24.49	x	0.51	x	0.8	=	38.36	(76)
East	0.9x	0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(76)
East	0.9x	0.77	x	5.54	x	16.15	x	0.51	x	0.8	=	25.3	(76)
South	0.9x	0.77	x	1.73	x	46.75	x	0.51	x	0.8	=	22.87	(78)
South	0.9x	0.77	x	1.73	x	76.57	x	0.51	x	0.8	=	37.45	(78)
South	0.9x	0.77	x	1.73	x	97.53	x	0.51	x	0.8	=	47.71	(78)
South	0.9x	0.77	x	1.73	x	110.23	x	0.51	x	0.8	=	53.92	(78)
South	0.9x	0.77	x	1.73	x	114.87	x	0.51	x	0.8	=	56.19	(78)
South	0.9x	0.77	x	1.73	x	110.55	x	0.51	x	0.8	=	54.07	(78)
South	0.9x	0.77	x	1.73	x	108.01	x	0.51	x	0.8	=	52.83	(78)
South	0.9x	0.77	x	1.73	x	104.89	x	0.51	x	0.8	=	51.31	(78)
South	0.9x	0.77	x	1.73	x	101.89	x	0.51	x	0.8	=	49.84	(78)
South	0.9x	0.77	x	1.73	x	82.59	x	0.51	x	0.8	=	40.4	(78)
South	0.9x	0.77	x	1.73	x	55.42	x	0.51	x	0.8	=	27.11	(78)
South	0.9x	0.77	x	1.73	x	40.4	x	0.51	x	0.8	=	19.76	(78)
Rooflights	0.9x	1	x	1.63	x	34.34	x	0.63	x	0.7	=	22.24	(82)
Rooflights	0.9x	1	x	1.63	x	66.69	x	0.63	x	0.7	=	43.19	(82)
Rooflights	0.9x	1	x	1.63	x	109.61	x	0.63	x	0.7	=	71	(82)

DER WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	1.63	x	161.05	x	0.63	x	0.7	=	104.32	(82)
Rooflights 0.9x	1	x	1.63	x	199.42	x	0.63	x	0.7	=	129.17	(82)
Rooflights 0.9x	1	x	1.63	x	205.27	x	0.63	x	0.7	=	132.96	(82)
Rooflights 0.9x	1	x	1.63	x	194.95	x	0.63	x	0.7	=	126.28	(82)
Rooflights 0.9x	1	x	1.63	x	165.92	x	0.63	x	0.7	=	107.47	(82)
Rooflights 0.9x	1	x	1.63	x	127.73	x	0.63	x	0.7	=	82.74	(82)
Rooflights 0.9x	1	x	1.63	x	78.98	x	0.63	x	0.7	=	51.16	(82)
Rooflights 0.9x	1	x	1.63	x	42.71	x	0.63	x	0.7	=	27.66	(82)
Rooflights 0.9x	1	x	1.63	x	28.32	x	0.63	x	0.7	=	18.35	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	123.98	233.53	373.57	544.76	678.63	702.15	665.24	562.13	432.93	273.18	152.69	103.31	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	462.53	570.16	698.15	849.94	964.2	968.72	919.39	821.82	702.51	562.37	464.42	431.84	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.93	0.89	0.83	0.72	0.59	0.45	0.35	0.4	0.59	0.8	0.9	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	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=	20.4	20.4	20.4	20.41	20.41	20.42	20.42	20.42	20.41	20.41	20.41	20.4	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.92	0.89	0.82	0.71	0.57	0.42	0.31	0.35	0.56	0.78	0.9	0.93	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.4	20.4	20.4	20.41	20.41	20.42	20.42	20.42	20.41	20.41	20.41	20.4	(90)

fLA = Living area ÷ (4) = 0.42 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(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=	0.93	0.89	0.83	0.71	0.58	0.43	0.33	0.37	0.58	0.79	0.9	0.94	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	428.58	507.57	576.64	607.62	555.73	419.78	299.14	305.74	404.65	445.06	417.31	403.79	(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=	1345.99	1293.18	1158.75	949.58	721.49	481.54	322.64	337.66	524.02	810.11	1097.91	1339.95	(97)

DER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	682.55	527.93	433.09	246.21	123.33	0	0	0	0	271.59	490.03	696.5

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3471.23 (98)

Space heating requirement in kWh/m²/year 50.9 (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 1 512.02 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	682.55	527.93	433.09	246.21	123.33	0	0	0	0	271.59	490.03	696.5	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	133.3	103.11	84.58	48.09	24.09	0	0	0	0	53.04	95.7	136.03	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 677.94 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	155.15	136.1	141.39	124.62	120.58	105.53	99.24	111.8	112.51	129.33	139.43	150.7

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	79.9	70.09	72.82	64.18	62.1	54.34	51.11	57.58	57.94	66.6	71.8	77.61

Total = Sum(219a)$_{1...12}$ = 786.06 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		677.94
Water heating fuel used		786.06
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	177.85	(230a)
warm air heating system fans	92.07	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		269.92 (231)
Electricity for lighting		303.96 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2037.88 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

DER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	351.85	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	407.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =				759.82	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	140.09	(267)
Electricity for lighting	(232) x		0.519	=	157.75	(268)
Total CO2, kg/year		sum of (265)…(271) =			1057.66	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			15.51	(273)
EI rating (section 14)					87	(274)

Predicted Energy Assessment

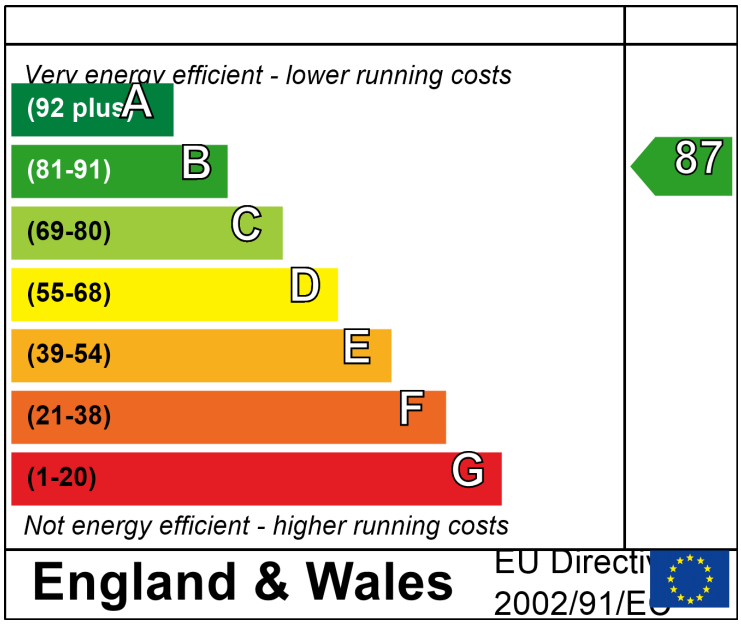
FLAT 10
43 London Street
Reading
RG1 4PS

Dwelling type: Top floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 68.2 m²

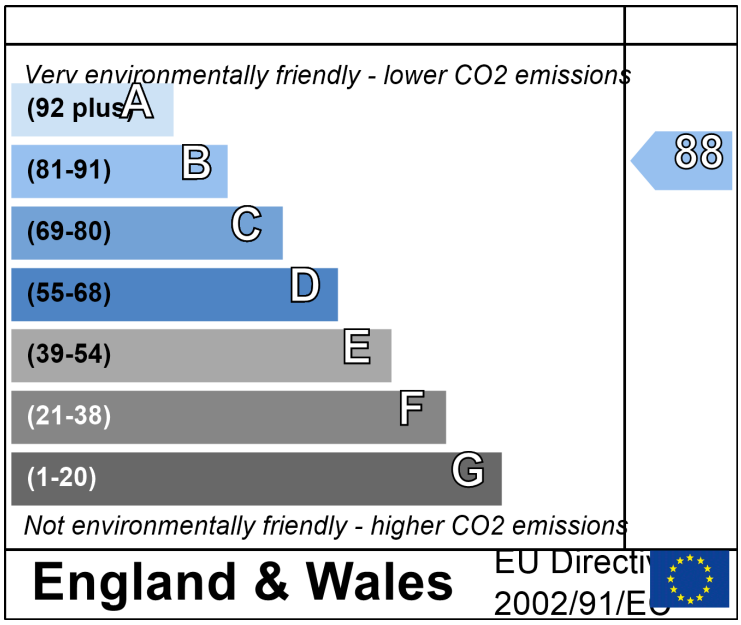
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 10

Address : FLAT 10, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	68.2	(1a) x	2.25	(2a) =	153.45	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	68.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		153.45	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.85	=	1.785			(26)
Windows Type 1			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 2			1.75	x	1/[1/(1.1)+ 0.04]	=	1.84			(27)
Windows Type 3			4.29	x	1/[1/(1.1)+ 0.04]	=	4.52			(27)
Windows Type 4			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 5			1.73	x	1/[1/(0.92)+ 0.04]	=	1.54			(27)
Windows Type 6			5.54	x	1/[1/(0.92)+ 0.04]	=	4.92			(27)
Rooflights			1.632	x	1/[1/(1.3) + 0.04]	=	2.1216			(27b)
Walls Type1	17.98	2.1	15.88	x	0.19	=	3.02	14	222.32	(29)
Walls Type2	24.32	0	24.32	x	0.16	=	3.89	14	340.48	(29)
Walls Type3	45.38	19.64	25.74	x	0.12	=	3.09	14	360.29	(29)
Roof Type1	38.8	0	38.8	x	0.11	=	4.27	9	349.2	(30)
Roof Type2	30.3	1.63	28.67	x	0.11	=	3.15	9	258.01	(30)
Total area of elements, m²			156.77							(31)
Party wall			3.15	x	0	=	0	20	63	(32)
Party floor			68.2					30	2046	(32a)
Internal wall **			132.21					9	1189.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 40.7 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4829.19 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 70.81 (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 23.52 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 64.22 (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=	18.11	17.89	17.67	16.56	16.34	15.23	15.23	15.01	15.67	16.34	16.78	17.22	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	82.33	82.11	81.89	80.78	80.56	79.45	79.45	79.23	79.89	80.56	81	81.44	

Average = Sum(39)$_{1...12}$ /12= 80.72 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.21	1.2	1.2	1.18	1.18	1.16	1.16	1.16	1.17	1.18	1.19	1.19	

Average = Sum(40)$_{1...12}$ /12= 1.18 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.2 (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 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

SAP WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	155.15	136.1	141.39	124.62	120.58	105.53	99.24	111.8	112.51	129.33	139.43	150.7	(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=	155.15	136.1	141.39	124.62	120.58	105.53	99.24	111.8	112.51	129.33	139.43	150.7	

Output from water heater (annual)$_{1...12}$ 1526.37 (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=	46.91	41.03	42.34	36.91	35.42	30.56	28.32	32.5	32.89	38.33	41.84	45.43	(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=	132.1	132.1	132.1	132.1	132.1	132.1	132.1	132.1	132.1	132.1	132.1	132.1	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	43.03	38.22	31.08	23.53	17.59	14.85	16.05	20.86	27.99	35.54	41.48	44.22	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	288.15	291.14	283.6	267.56	247.31	228.28	215.57	212.58	220.11	236.16	256.4	275.44	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	50.41	50.41	50.41	50.41	50.41	50.41	50.41	50.41	50.41	50.41	50.41	50.41	(69)

Pumps and fans gains (Table 5a)

(70)m=	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	9.21	(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=	63.05	61.06	56.91	51.27	47.6	42.45	38.07	43.68	45.68	51.51	58.11	61.06	(72)

SAP WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	497.88	494.06	475.24	446.01	416.16	389.23	373.33	380.77	397.43	426.86	459.65	484.37	(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)	
North	0.9x 1	x	1.75	x	10.63	x	0.63	x	0.7	=	14.77	(74)
North	0.9x 1	x	4.29	x	10.63	x	0.63	x	0.7	=	18.11	(74)
North	0.9x 1	x	1.71	x	10.63	x	0.63	x	0.7	=	7.22	(74)
North	0.9x 1	x	1.75	x	20.32	x	0.63	x	0.7	=	28.23	(74)
North	0.9x 1	x	4.29	x	20.32	x	0.63	x	0.7	=	34.6	(74)
North	0.9x 1	x	1.71	x	20.32	x	0.63	x	0.7	=	13.79	(74)
North	0.9x 1	x	1.75	x	34.53	x	0.63	x	0.7	=	47.97	(74)
North	0.9x 1	x	4.29	x	34.53	x	0.63	x	0.7	=	58.79	(74)
North	0.9x 1	x	1.71	x	34.53	x	0.63	x	0.7	=	23.44	(74)
North	0.9x 1	x	1.75	x	55.46	x	0.63	x	0.7	=	77.05	(74)
North	0.9x 1	x	4.29	x	55.46	x	0.63	x	0.7	=	94.44	(74)
North	0.9x 1	x	1.71	x	55.46	x	0.63	x	0.7	=	37.64	(74)
North	0.9x 1	x	1.75	x	74.72	x	0.63	x	0.7	=	103.79	(74)
North	0.9x 1	x	4.29	x	74.72	x	0.63	x	0.7	=	127.22	(74)
North	0.9x 1	x	1.71	x	74.72	x	0.63	x	0.7	=	50.71	(74)
North	0.9x 1	x	1.75	x	79.99	x	0.63	x	0.7	=	111.11	(74)
North	0.9x 1	x	4.29	x	79.99	x	0.63	x	0.7	=	136.19	(74)
North	0.9x 1	x	1.71	x	79.99	x	0.63	x	0.7	=	54.29	(74)
North	0.9x 1	x	1.75	x	74.68	x	0.63	x	0.7	=	103.74	(74)
North	0.9x 1	x	4.29	x	74.68	x	0.63	x	0.7	=	127.15	(74)
North	0.9x 1	x	1.71	x	74.68	x	0.63	x	0.7	=	50.68	(74)
North	0.9x 1	x	1.75	x	59.25	x	0.63	x	0.7	=	82.3	(74)
North	0.9x 1	x	4.29	x	59.25	x	0.63	x	0.7	=	100.88	(74)
North	0.9x 1	x	1.71	x	59.25	x	0.63	x	0.7	=	40.21	(74)
North	0.9x 1	x	1.75	x	41.52	x	0.63	x	0.7	=	57.67	(74)
North	0.9x 1	x	4.29	x	41.52	x	0.63	x	0.7	=	70.69	(74)
North	0.9x 1	x	1.71	x	41.52	x	0.63	x	0.7	=	28.18	(74)
North	0.9x 1	x	1.75	x	24.19	x	0.63	x	0.7	=	33.6	(74)
North	0.9x 1	x	4.29	x	24.19	x	0.63	x	0.7	=	41.19	(74)
North	0.9x 1	x	1.71	x	24.19	x	0.63	x	0.7	=	16.42	(74)
North	0.9x 1	x	1.75	x	13.12	x	0.63	x	0.7	=	18.22	(74)
North	0.9x 1	x	4.29	x	13.12	x	0.63	x	0.7	=	22.34	(74)
North	0.9x 1	x	1.71	x	13.12	x	0.63	x	0.7	=	8.9	(74)
North	0.9x 1	x	1.75	x	8.86	x	0.63	x	0.7	=	12.31	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	1	x	4.29	x	8.86	x	0.63	x	0.7	=	15.09	(74)
North	0.9x	1	x	1.71	x	8.86	x	0.63	x	0.7	=	6.02	(74)
East	0.9x	1	x	2.87	x	19.64	x	0.63	x	0.7	=	22.37	(76)
East	0.9x	1	x	5.54	x	19.64	x	0.51	x	0.8	=	39.95	(76)
East	0.9x	1	x	2.87	x	38.42	x	0.63	x	0.7	=	43.76	(76)
East	0.9x	1	x	5.54	x	38.42	x	0.51	x	0.8	=	78.16	(76)
East	0.9x	1	x	2.87	x	63.27	x	0.63	x	0.7	=	72.07	(76)
East	0.9x	1	x	5.54	x	63.27	x	0.51	x	0.8	=	128.72	(76)
East	0.9x	1	x	2.87	x	92.28	x	0.63	x	0.7	=	105.12	(76)
East	0.9x	1	x	5.54	x	92.28	x	0.51	x	0.8	=	187.72	(76)
East	0.9x	1	x	2.87	x	113.09	x	0.63	x	0.7	=	128.82	(76)
East	0.9x	1	x	5.54	x	113.09	x	0.51	x	0.8	=	230.06	(76)
East	0.9x	1	x	2.87	x	115.77	x	0.63	x	0.7	=	131.87	(76)
East	0.9x	1	x	5.54	x	115.77	x	0.51	x	0.8	=	235.51	(76)
East	0.9x	1	x	2.87	x	110.22	x	0.63	x	0.7	=	125.55	(76)
East	0.9x	1	x	5.54	x	110.22	x	0.51	x	0.8	=	224.22	(76)
East	0.9x	1	x	2.87	x	94.68	x	0.63	x	0.7	=	107.85	(76)
East	0.9x	1	x	5.54	x	94.68	x	0.51	x	0.8	=	192.6	(76)
East	0.9x	1	x	2.87	x	73.59	x	0.63	x	0.7	=	83.83	(76)
East	0.9x	1	x	5.54	x	73.59	x	0.51	x	0.8	=	149.7	(76)
East	0.9x	1	x	2.87	x	45.59	x	0.63	x	0.7	=	51.93	(76)
East	0.9x	1	x	5.54	x	45.59	x	0.51	x	0.8	=	92.74	(76)
East	0.9x	1	x	2.87	x	24.49	x	0.63	x	0.7	=	27.9	(76)
East	0.9x	1	x	5.54	x	24.49	x	0.51	x	0.8	=	49.82	(76)
East	0.9x	1	x	2.87	x	16.15	x	0.63	x	0.7	=	18.4	(76)
East	0.9x	1	x	5.54	x	16.15	x	0.51	x	0.8	=	32.86	(76)
South	0.9x	1	x	1.73	x	46.75	x	0.51	x	0.8	=	29.7	(78)
South	0.9x	1	x	1.73	x	76.57	x	0.51	x	0.8	=	48.64	(78)
South	0.9x	1	x	1.73	x	97.53	x	0.51	x	0.8	=	61.96	(78)
South	0.9x	1	x	1.73	x	110.23	x	0.51	x	0.8	=	70.03	(78)
South	0.9x	1	x	1.73	x	114.87	x	0.51	x	0.8	=	72.97	(78)
South	0.9x	1	x	1.73	x	110.55	x	0.51	x	0.8	=	70.23	(78)
South	0.9x	1	x	1.73	x	108.01	x	0.51	x	0.8	=	68.62	(78)
South	0.9x	1	x	1.73	x	104.89	x	0.51	x	0.8	=	66.63	(78)
South	0.9x	1	x	1.73	x	101.89	x	0.51	x	0.8	=	64.72	(78)
South	0.9x	1	x	1.73	x	82.59	x	0.51	x	0.8	=	52.46	(78)
South	0.9x	1	x	1.73	x	55.42	x	0.51	x	0.8	=	35.2	(78)
South	0.9x	1	x	1.73	x	40.4	x	0.51	x	0.8	=	25.66	(78)
Rooflights	0.9x	1	x	1.63	x	34.34	x	0.63	x	0.7	=	22.24	(82)
Rooflights	0.9x	1	x	1.63	x	66.69	x	0.63	x	0.7	=	43.19	(82)
Rooflights	0.9x	1	x	1.63	x	109.61	x	0.63	x	0.7	=	71	(82)

SAP WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	1.63	x	161.05	x	0.63	x	0.7	=	104.32	(82)
Rooflights 0.9x	1	x	1.63	x	199.42	x	0.63	x	0.7	=	129.17	(82)
Rooflights 0.9x	1	x	1.63	x	205.27	x	0.63	x	0.7	=	132.96	(82)
Rooflights 0.9x	1	x	1.63	x	194.95	x	0.63	x	0.7	=	126.28	(82)
Rooflights 0.9x	1	x	1.63	x	165.92	x	0.63	x	0.7	=	107.47	(82)
Rooflights 0.9x	1	x	1.63	x	127.73	x	0.63	x	0.7	=	82.74	(82)
Rooflights 0.9x	1	x	1.63	x	78.98	x	0.63	x	0.7	=	51.16	(82)
Rooflights 0.9x	1	x	1.63	x	42.71	x	0.63	x	0.7	=	27.66	(82)
Rooflights 0.9x	1	x	1.63	x	28.32	x	0.63	x	0.7	=	18.35	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	154.36	290.38	463.95	676.32	842.75	872.16	826.23	697.94	537.53	339.5	190.04	128.69	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	652.24	784.44	939.19	1122.33	1258.91	1261.4	1199.56	1078.71	934.96	766.37	649.69	613.06	(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=	0.88	0.83	0.75	0.63	0.49	0.37	0.28	0.31	0.49	0.71	0.84	0.89	(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=	20.4	20.4	20.4	20.41	20.41	20.42	20.42	20.42	20.41	20.41	20.41	20.4	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.87	0.82	0.74	0.61	0.47	0.34	0.24	0.28	0.46	0.69	0.83	0.88	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.4	20.4	20.4	20.41	20.41	20.42	20.42	20.42	20.41	20.41	20.41	20.4	(90)

fLA = Living area ÷ (4) = 0.42 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(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=	0.87	0.82	0.74	0.62	0.48	0.35	0.26	0.29	0.47	0.7	0.83	0.88	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	569.21	646.36	699.17	695.87	605.88	441.1	307.93	317.56	443.23	534.23	540.28	542.31	(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=	1345.99	1293.18	1158.75	949.58	721.49	481.54	322.64	337.66	524.02	810.11	1097.91	1339.95	(97)

SAP WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	577.92	434.66	341.93	182.67	86.02	0	0	0	0	205.25	401.5	593.45

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2823.4 (98)

Space heating requirement in kWh/m²/year 41.4 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 512.02 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	577.92	434.66	341.93	182.67	86.02	0	0	0	0	205.25	401.5	593.45	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	112.87	84.89	66.78	35.68	16.8	0	0	0	0	40.09	78.41	115.9	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 551.42 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	155.15	136.1	141.39	124.62	120.58	105.53	99.24	111.8	112.51	129.33	139.43	150.7

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	79.9	70.09	72.82	64.18	62.1	54.34	51.11	57.58	57.94	66.6	71.8	77.61

Total = Sum(219a)$_{1...12}$ = 786.06 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		551.42
Water heating fuel used		786.06
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	177.85	(230a)
warm air heating system fans	92.07	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		269.92 (231)
Electricity for lighting		303.96 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1911.36 (338)

10a. Fuel costs - individual heating systems:

SAP WorkSheet: New dwelling design stage

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		13.19	x 0.01 =	72.73	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	103.68	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	35.6	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	40.09	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				252.11	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.94	(257)
SAP rating (Section 12)	86.95	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	286.19	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	407.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =				694.15	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	140.09	(267)
Electricity for lighting	(232) x		0.519	=	157.75	(268)
Total CO2, kg/year		sum of (265)…(271) =			992	(272)
CO2 emissions per m²		(272) ÷ (4) =			14.55	(273)
EI rating (section 14)					88	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		3.07	=	1692.86	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2413.21	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4106.07	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	828.65	(267)

SAP WorkSheet: New dwelling design stage

Electricity for lighting	(232)	x	0	=	933.16 (268)
'Total Primary Energy			sum of (265)…(271) =		5867.87 (272)
Primary energy kWh/m²/year			(272) ÷ (4) =		86.04 (273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 10

Address : FLAT 10, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	68.2 (1a)	x	2.25 (2a)	=	153.45	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	68.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	153.45	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.27	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31

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=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			2.02	x1/[1/(1.4)+ 0.04]		=	2.68			(27)
Windows Type 2			1.23	x1/[1/(1.4)+ 0.04]		=	1.63			(27)
Windows Type 3			3.02	x1/[1/(1.4)+ 0.04]		=	4			(27)
Windows Type 4			1.2	x1/[1/(1.4)+ 0.04]		=	1.59			(27)
Windows Type 5			1.22	x1/[1/(1.4)+ 0.04]		=	1.62			(27)
Windows Type 6			3.89	x1/[1/(1.4)+ 0.04]		=	5.16			(27)
Rooflights			1.146973	x1/[1/(1.7) + 0.04]		=	1.949853			(27b)
Walls Type1	17.98	2.1	15.88	x	0.18	=	2.86			(29)
Walls Type2	24.32	0	24.32	x	0.18	=	4.38			(29)
Walls Type3	45.38	13.81	31.56	x	0.18	=	5.68			(29)
Roof Type1	38.8	0	38.8	x	0.13	=	5.04			(30)
Roof Type2	30.3	1.15	29.15	x	0.13	=	3.79			(30)
Total area of elements, m²			156.77							(31)
Party wall			3.15	x	0	=	0			(32)
Party floor			68.2							(32a)
Internal wall **			132.21							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 43.99 (33)

TER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4915.18 (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 7.84 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 51.82 (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=	28.24	28.12	28.01	27.49	27.39	26.94	26.94	26.85	27.11	27.39	27.59	27.8	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	80.06	79.95	79.84	79.32	79.22	78.76	78.76	78.68	78.94	79.22	79.42	79.62	

Average = Sum(39)$_{1...12}$ /12= 79.32 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.17	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.16	1.16	1.16	1.17	

Average = Sum(40)$_{1...12}$ /12= 1.16 (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 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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

TER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	190.33	167.87	176.58	158.67	155.76	139.57	134.42	146.98	146.56	164.51	173.48	185.88	(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=	190.33	167.87	176.58	158.67	155.76	139.57	134.42	146.98	146.56	164.51	173.48	185.88	

Output from water heater (annual)$_{1...12}$: 1940.6 (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=	86.31	76.61	81.73	75.03	74.81	68.69	67.71	71.89	71.01	77.72	79.96	84.83	(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=	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=	116	114	109.86	104.22	100.55	95.4	91.01	96.63	98.62	104.46	111.05	114.01	(72)

TER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	385.3	383.38	371.33	351.92	332.31	313.31	300.89	306.43	316.32	335.93	358.46	375.27	(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	1.23	x	10.63	x	0.63	x	0.7	=	7.99	(74)
North	0.9x 0.77	x	3.02	x	10.63	x	0.63	x	0.7	=	9.81	(74)
North	0.9x 0.77	x	1.2	x	10.63	x	0.63	x	0.7	=	3.9	(74)
North	0.9x 0.77	x	1.23	x	20.32	x	0.63	x	0.7	=	15.28	(74)
North	0.9x 0.77	x	3.02	x	20.32	x	0.63	x	0.7	=	18.76	(74)
North	0.9x 0.77	x	1.2	x	20.32	x	0.63	x	0.7	=	7.45	(74)
North	0.9x 0.77	x	1.23	x	34.53	x	0.63	x	0.7	=	25.96	(74)
North	0.9x 0.77	x	3.02	x	34.53	x	0.63	x	0.7	=	31.87	(74)
North	0.9x 0.77	x	1.2	x	34.53	x	0.63	x	0.7	=	12.66	(74)
North	0.9x 0.77	x	1.23	x	55.46	x	0.63	x	0.7	=	41.7	(74)
North	0.9x 0.77	x	3.02	x	55.46	x	0.63	x	0.7	=	51.19	(74)
North	0.9x 0.77	x	1.2	x	55.46	x	0.63	x	0.7	=	20.34	(74)
North	0.9x 0.77	x	1.23	x	74.72	x	0.63	x	0.7	=	56.17	(74)
North	0.9x 0.77	x	3.02	x	74.72	x	0.63	x	0.7	=	68.96	(74)
North	0.9x 0.77	x	1.2	x	74.72	x	0.63	x	0.7	=	27.4	(74)
North	0.9x 0.77	x	1.23	x	79.99	x	0.63	x	0.7	=	60.13	(74)
North	0.9x 0.77	x	3.02	x	79.99	x	0.63	x	0.7	=	73.82	(74)
North	0.9x 0.77	x	1.2	x	79.99	x	0.63	x	0.7	=	29.33	(74)
North	0.9x 0.77	x	1.23	x	74.68	x	0.63	x	0.7	=	56.14	(74)
North	0.9x 0.77	x	3.02	x	74.68	x	0.63	x	0.7	=	68.92	(74)
North	0.9x 0.77	x	1.2	x	74.68	x	0.63	x	0.7	=	27.39	(74)
North	0.9x 0.77	x	1.23	x	59.25	x	0.63	x	0.7	=	44.54	(74)
North	0.9x 0.77	x	3.02	x	59.25	x	0.63	x	0.7	=	54.68	(74)
North	0.9x 0.77	x	1.2	x	59.25	x	0.63	x	0.7	=	21.73	(74)
North	0.9x 0.77	x	1.23	x	41.52	x	0.63	x	0.7	=	31.21	(74)
North	0.9x 0.77	x	3.02	x	41.52	x	0.63	x	0.7	=	38.32	(74)
North	0.9x 0.77	x	1.2	x	41.52	x	0.63	x	0.7	=	15.23	(74)
North	0.9x 0.77	x	1.23	x	24.19	x	0.63	x	0.7	=	18.19	(74)
North	0.9x 0.77	x	3.02	x	24.19	x	0.63	x	0.7	=	22.33	(74)
North	0.9x 0.77	x	1.2	x	24.19	x	0.63	x	0.7	=	8.87	(74)
North	0.9x 0.77	x	1.23	x	13.12	x	0.63	x	0.7	=	9.86	(74)
North	0.9x 0.77	x	3.02	x	13.12	x	0.63	x	0.7	=	12.11	(74)
North	0.9x 0.77	x	1.2	x	13.12	x	0.63	x	0.7	=	4.81	(74)
North	0.9x 0.77	x	1.23	x	8.86	x	0.63	x	0.7	=	6.66	(74)

TER WorkSheet: New dwelling design stage

North	0.9x	0.77	x	3.02	x	8.86	x	0.63	x	0.7	=	8.18	(74)
North	0.9x	0.77	x	1.2	x	8.86	x	0.63	x	0.7	=	3.25	(74)
East	0.9x	0.77	x	2.02	x	19.64	x	0.63	x	0.7	=	12.12	(76)
East	0.9x	0.77	x	3.89	x	19.64	x	0.63	x	0.7	=	23.35	(76)
East	0.9x	0.77	x	2.02	x	38.42	x	0.63	x	0.7	=	23.72	(76)
East	0.9x	0.77	x	3.89	x	38.42	x	0.63	x	0.7	=	45.68	(76)
East	0.9x	0.77	x	2.02	x	63.27	x	0.63	x	0.7	=	39.06	(76)
East	0.9x	0.77	x	3.89	x	63.27	x	0.63	x	0.7	=	75.22	(76)
East	0.9x	0.77	x	2.02	x	92.28	x	0.63	x	0.7	=	56.97	(76)
East	0.9x	0.77	x	3.89	x	92.28	x	0.63	x	0.7	=	109.71	(76)
East	0.9x	0.77	x	2.02	x	113.09	x	0.63	x	0.7	=	69.82	(76)
East	0.9x	0.77	x	3.89	x	113.09	x	0.63	x	0.7	=	134.45	(76)
East	0.9x	0.77	x	2.02	x	115.77	x	0.63	x	0.7	=	71.47	(76)
East	0.9x	0.77	x	3.89	x	115.77	x	0.63	x	0.7	=	137.63	(76)
East	0.9x	0.77	x	2.02	x	110.22	x	0.63	x	0.7	=	68.04	(76)
East	0.9x	0.77	x	3.89	x	110.22	x	0.63	x	0.7	=	131.03	(76)
East	0.9x	0.77	x	2.02	x	94.68	x	0.63	x	0.7	=	58.45	(76)
East	0.9x	0.77	x	3.89	x	94.68	x	0.63	x	0.7	=	112.55	(76)
East	0.9x	0.77	x	2.02	x	73.59	x	0.63	x	0.7	=	45.43	(76)
East	0.9x	0.77	x	3.89	x	73.59	x	0.63	x	0.7	=	87.49	(76)
East	0.9x	0.77	x	2.02	x	45.59	x	0.63	x	0.7	=	28.14	(76)
East	0.9x	0.77	x	3.89	x	45.59	x	0.63	x	0.7	=	54.2	(76)
East	0.9x	0.77	x	2.02	x	24.49	x	0.63	x	0.7	=	15.12	(76)
East	0.9x	0.77	x	3.89	x	24.49	x	0.63	x	0.7	=	29.11	(76)
East	0.9x	0.77	x	2.02	x	16.15	x	0.63	x	0.7	=	9.97	(76)
East	0.9x	0.77	x	3.89	x	16.15	x	0.63	x	0.7	=	19.2	(76)
South	0.9x	0.77	x	1.22	x	46.75	x	0.63	x	0.7	=	17.43	(78)
South	0.9x	0.77	x	1.22	x	76.57	x	0.63	x	0.7	=	28.55	(78)
South	0.9x	0.77	x	1.22	x	97.53	x	0.63	x	0.7	=	36.37	(78)
South	0.9x	0.77	x	1.22	x	110.23	x	0.63	x	0.7	=	41.1	(78)
South	0.9x	0.77	x	1.22	x	114.87	x	0.63	x	0.7	=	42.83	(78)
South	0.9x	0.77	x	1.22	x	110.55	x	0.63	x	0.7	=	41.22	(78)
South	0.9x	0.77	x	1.22	x	108.01	x	0.63	x	0.7	=	40.27	(78)
South	0.9x	0.77	x	1.22	x	104.89	x	0.63	x	0.7	=	39.11	(78)
South	0.9x	0.77	x	1.22	x	101.89	x	0.63	x	0.7	=	37.99	(78)
South	0.9x	0.77	x	1.22	x	82.59	x	0.63	x	0.7	=	30.79	(78)
South	0.9x	0.77	x	1.22	x	55.42	x	0.63	x	0.7	=	20.66	(78)
South	0.9x	0.77	x	1.22	x	40.4	x	0.63	x	0.7	=	15.06	(78)
Rooflights	0.9x	1	x	1.15	x	34.34	x	0.63	x	0.7	=	15.63	(82)
Rooflights	0.9x	1	x	1.15	x	66.69	x	0.63	x	0.7	=	30.36	(82)
Rooflights	0.9x	1	x	1.15	x	109.61	x	0.63	x	0.7	=	49.9	(82)

TER WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	1.15	x	161.05	x	0.63	x	0.7	=	73.32	(82)
Rooflights 0.9x	1	x	1.15	x	199.42	x	0.63	x	0.7	=	90.78	(82)
Rooflights 0.9x	1	x	1.15	x	205.27	x	0.63	x	0.7	=	93.45	(82)
Rooflights 0.9x	1	x	1.15	x	194.95	x	0.63	x	0.7	=	88.75	(82)
Rooflights 0.9x	1	x	1.15	x	165.92	x	0.63	x	0.7	=	75.53	(82)
Rooflights 0.9x	1	x	1.15	x	127.73	x	0.63	x	0.7	=	58.15	(82)
Rooflights 0.9x	1	x	1.15	x	78.98	x	0.63	x	0.7	=	35.96	(82)
Rooflights 0.9x	1	x	1.15	x	42.71	x	0.63	x	0.7	=	19.44	(82)
Rooflights 0.9x	1	x	1.15	x	28.32	x	0.63	x	0.7	=	12.89	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	90.25	169.78	271.04	394.32	490.41	507.06	480.54	406.59	313.81	198.47	111.11	75.23	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	475.54	553.16	642.37	746.24	822.72	820.37	781.43	713.02	630.13	534.4	469.58	450.49	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.92	0.78	0.59	0.44	0.5	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=	19.82	19.99	20.27	20.62	20.87	20.98	21	20.99	20.92	20.57	20.12	19.78	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.94	19.94	19.94	19.95	19.95	19.96	19.96	19.96	19.95	19.95	19.95	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.97	0.89	0.73	0.51	0.34	0.39	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=	18.38	18.62	19.03	19.53	19.84	19.94	19.95	19.95	19.89	19.47	18.83	18.33	(90)

fLA = Living area ÷ (4) = 0.42 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.98	19.19	19.55	19.98	20.27	20.37	20.39	20.39	20.32	19.93	19.37	18.93	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.98	19.19	19.55	19.98	20.27	20.37	20.39	20.39	20.32	19.93	19.37	18.93	(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	0.74	0.54	0.38	0.44	0.72	0.94	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	472.3	545.19	618.61	666.43	612.26	443.87	296.99	310.86	450.86	500.07	463.06	448.09	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1175.14	1142.77	1042	879.15	678.88	454.73	298.48	313.75	490.98	738.94	974.46	1173.2	(97)

TER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	522.92	401.57	315	153.16	49.56	0	0	0	0	177.72	368.21	539.48

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2527.62 (98)

Space heating requirement in kWh/m²/year 37.06 (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)	522.92	401.57	315	153.16	49.56	0	0	0	0	177.72	368.21	539.48	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	559.27	429.49	336.9	163.81	53.01	0	0	0	0	190.08	393.8	576.99	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2703.34 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	190.33	167.87	176.58	158.67	155.76	139.57	134.42	146.98	146.56	164.51	173.48	185.88

Efficiency of water heater 79.8 (216)

(217)m=	87.37	87.06	86.34	84.72	82.14	79.8	79.8	79.8	79.8	85.02	86.77	87.49

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	217.83	192.83	204.51	187.28	189.62	174.9	168.44	184.19	183.66	193.49	199.92	212.45

Total = Sum(219a)$_{1...12}$ = 2309.13 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2703.34
Water heating fuel used		2309.13
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)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		5391.43 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

TER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	583.92	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	498.77	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1082.69	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	157.76	(268)
Total CO2, kg/year		sum of (265)…(271) =			1279.38	(272)

TER = 27.49 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:02

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 86.2m²

Site Reference : 43LS **Plot Reference:** FLAT 11

Address : FLAT 11, 43 London Street, Reading, RG1 4PS

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)	24.73 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.26 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	**OK**
Roof	0.17 (max. 0.20)	0.17 (max. 0.35)	**OK**
Openings	0.97 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.76	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	6.74m²
Windows facing: East	2.63m²
Windows facing: North	2.1m²
Windows facing: South	2.1m²
Windows facing: South	2.87m²
Windows facing: West	2.87m²
Windows facing: East	0.56m²
Ventilation rate:	2.50
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 11

Address : FLAT 11, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	86.2	(1a) x	2.3	(2a) =	198.26	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	86.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		198.26	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.74	x	1/[1/(0.92)+ 0.04]	=	5.98			(27)
Windows Type 2			2.63	x	1/[1/(1.1)+ 0.04]	=	2.77			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 5			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 6			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 7			0.56	x	1/[1/(1.1)+ 0.04]	=	0.59			(27)
Floor			86.2	x	0.13	=	11.206	110	9482	(28)
Walls Type1	37.49	19.87	17.62	x	0.16	=	2.82	14	246.68	(29)
Walls Type2	14.49	0	14.49	x	0.14	=	2.03	9	130.41	(29)
Walls Type3	13.34	2.1	11.24	x	0.14	=	1.57	14	157.36	(29)
Walls Type4	14.49	0	14.49	x	0.16	=	2.32	14	202.86	(29)
Walls Type5	15.18	0	15.18	x	0.14	=	2.13	9	136.62	(29)
Roof	2.8	0	2.8	x	0.17	=	0.48	9	25.2	(30)
Total area of elements, m²			183.99							(31)
Party wall			17.71	x	0	=	0	20	354.2	(32)
Party ceiling			83.4					20	1668	(32b)
Internal wall **			145.82					9	1312.38	(32c)

DER WorkSheet: New dwelling design stage

** 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) =	43.06	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	13715.71	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	= (34) ÷ (4) =	159.11	(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		27.6	(36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	70.65	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	23.4	23.11	22.83	21.39	21.11	19.68	19.68	19.39	20.25	21.11	21.68	22.25	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	94.05	93.77	93.48	92.05	91.76	90.33	90.33	90.04	90.9	91.76	92.33	92.91	

Average = Sum(39)$_{1...12}$ /12= 91.98 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.04	1.05	1.06	1.07	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1	2.57	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 *Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)*	95.24	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	104.76	100.95	97.14	93.33	89.52	85.71	85.71	89.52	93.33	97.14	100.95	104.76	

Total = Sum(44)$_{1...12}$ = 1142.87 (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=	155.36	135.88	140.21	122.24	117.29	101.22	93.79	107.63	108.91	126.93	138.55	150.46	

Total = Sum(45)$_{1...12}$ = 1498.48 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.3	20.38	21.03	18.34	17.59	15.18	14.07	16.14	16.34	19.04	20.78	22.57	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel	180	(47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):	0.54	(48)
Temperature factor from Table 2b	0.4536	(49)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	169.42	148.58	154.28	135.85	131.36	114.82	107.85	121.69	122.52	140.99	152.16	164.52	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	169.42	148.58	154.28	135.85	131.36	114.82	107.85	121.69	122.52	140.99	152.16	164.52	

Output from water heater (annual)$_{1...12}$ 1664.04 (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=	51.66	45.18	46.62	40.65	39	33.65	31.19	35.79	36.21	42.2	46.07	50.03	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.67	18.36	14.93	11.31	8.45	7.14	7.71	10.02	13.45	17.08	19.93	21.25	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	231.91	234.32	228.25	215.34	199.05	183.73	173.5	171.09	177.15	190.06	206.36	221.68	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	(69)

Pumps and fans gains (Table 5a)

(70)m=	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	(71)

DER WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=	69.43	67.23	62.66	56.45	52.42	46.74	41.92	48.1	50.3	56.73	63.98	67.24	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	395.46	393.36	379.3	356.55	333.36	311.05	296.57	302.66	314.35	337.31	363.72	383.61	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x 0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x 0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x 0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x 0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x 0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x 0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x 0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x 0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x 0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x 0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
East	0.9x 0.77	x	6.74	x	19.64	x	0.51	x	0.8	=	37.43	(76)
East	0.9x 0.77	x	2.63	x	19.64	x	0.63	x	0.7	=	15.79	(76)
East	0.9x 0.77	x	0.56	x	19.64	x	0.63	x	0.7	=	3.36	(76)
East	0.9x 0.77	x	6.74	x	38.42	x	0.51	x	0.8	=	73.22	(76)
East	0.9x 0.77	x	2.63	x	38.42	x	0.63	x	0.7	=	30.88	(76)
East	0.9x 0.77	x	0.56	x	38.42	x	0.63	x	0.7	=	6.58	(76)
East	0.9x 0.77	x	6.74	x	63.27	x	0.51	x	0.8	=	120.58	(76)
East	0.9x 0.77	x	2.63	x	63.27	x	0.63	x	0.7	=	50.86	(76)
East	0.9x 0.77	x	0.56	x	63.27	x	0.63	x	0.7	=	10.83	(76)
East	0.9x 0.77	x	6.74	x	92.28	x	0.51	x	0.8	=	175.86	(76)
East	0.9x 0.77	x	2.63	x	92.28	x	0.63	x	0.7	=	74.17	(76)
East	0.9x 0.77	x	0.56	x	92.28	x	0.63	x	0.7	=	15.79	(76)
East	0.9x 0.77	x	6.74	x	113.09	x	0.51	x	0.8	=	215.52	(76)
East	0.9x 0.77	x	2.63	x	113.09	x	0.63	x	0.7	=	90.9	(76)
East	0.9x 0.77	x	0.56	x	113.09	x	0.63	x	0.7	=	19.36	(76)
East	0.9x 0.77	x	6.74	x	115.77	x	0.51	x	0.8	=	220.62	(76)
East	0.9x 0.77	x	2.63	x	115.77	x	0.63	x	0.7	=	93.05	(76)
East	0.9x 0.77	x	0.56	x	115.77	x	0.63	x	0.7	=	19.81	(76)
East	0.9x 0.77	x	6.74	x	110.22	x	0.51	x	0.8	=	210.04	(76)
East	0.9x 0.77	x	2.63	x	110.22	x	0.63	x	0.7	=	88.59	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	0.56	x	110.22	x	0.63	x	0.7	=	18.86	(76)
East	0.9x	0.77	x	6.74	x	94.68	x	0.51	x	0.8	=	180.42	(76)
East	0.9x	0.77	x	2.63	x	94.68	x	0.63	x	0.7	=	76.1	(76)
East	0.9x	0.77	x	0.56	x	94.68	x	0.63	x	0.7	=	16.2	(76)
East	0.9x	0.77	x	6.74	x	73.59	x	0.51	x	0.8	=	140.24	(76)
East	0.9x	0.77	x	2.63	x	73.59	x	0.63	x	0.7	=	59.15	(76)
East	0.9x	0.77	x	0.56	x	73.59	x	0.63	x	0.7	=	12.59	(76)
East	0.9x	0.77	x	6.74	x	45.59	x	0.51	x	0.8	=	86.88	(76)
East	0.9x	0.77	x	2.63	x	45.59	x	0.63	x	0.7	=	36.64	(76)
East	0.9x	0.77	x	0.56	x	45.59	x	0.63	x	0.7	=	7.8	(76)
East	0.9x	0.77	x	6.74	x	24.49	x	0.51	x	0.8	=	46.67	(76)
East	0.9x	0.77	x	2.63	x	24.49	x	0.63	x	0.7	=	19.68	(76)
East	0.9x	0.77	x	0.56	x	24.49	x	0.63	x	0.7	=	4.19	(76)
East	0.9x	0.77	x	6.74	x	16.15	x	0.51	x	0.8	=	30.78	(76)
East	0.9x	0.77	x	2.63	x	16.15	x	0.63	x	0.7	=	12.98	(76)
East	0.9x	0.77	x	0.56	x	16.15	x	0.63	x	0.7	=	2.76	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.87	x	46.75	x	0.63	x	0.7	=	41.01	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.87	x	76.57	x	0.63	x	0.7	=	67.16	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.87	x	97.53	x	0.63	x	0.7	=	85.55	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.87	x	110.23	x	0.63	x	0.7	=	96.69	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.87	x	114.87	x	0.63	x	0.7	=	100.75	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.87	x	110.55	x	0.63	x	0.7	=	96.96	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.87	x	108.01	x	0.63	x	0.7	=	94.74	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.87	x	104.89	x	0.63	x	0.7	=	92	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.87	x	101.89	x	0.63	x	0.7	=	89.36	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.87	x	82.59	x	0.63	x	0.7	=	72.44	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.87	x	55.42	x	0.63	x	0.7	=	48.61	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
South	0.9x	0.77	x	2.87	x	40.4	x	0.63	x	0.7	=	35.43	(78)
West	0.9x	0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(80)
West	0.9x	0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(80)
West	0.9x	0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(80)
West	0.9x	0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(80)
West	0.9x	0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(80)
West	0.9x	0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(80)
West	0.9x	0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(80)
West	0.9x	0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(80)
West	0.9x	0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(80)
West	0.9x	0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(80)
West	0.9x	0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.64	273.71	408.07	549.79	647.4	654.28	626.15	553.11	457.93	312.27	184.61	127.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	547.1	667.07	787.36	906.34	980.76	965.33	922.72	855.77	772.27	649.59	548.34	511.36	(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=	0.99	0.97	0.94	0.86	0.73	0.56	0.42	0.47	0.7	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	21	21	21	21	21	21	21	21	21	21	21	21	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.97	0.93	0.85	0.71	0.52	0.37	0.42	0.67	0.9	0.97	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(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	0.94	0.85	0.72	0.54	0.39	0.44	0.68	0.9	0.97	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	539.34	647.41	736.64	773.65	701.75	518.38	360.27	373.76	524.62	586.54	534.11	505.62	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1537.56	1476.73	1322.75	1082.08	821.88	547.59	366.93	383.87	596.31	922.82	1251.54	1528.53	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	742.68	557.3	436.07	222.07	89.38	0	0	0	0	250.19	516.55	761.05	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3575.28 (98)

Space heating requirement in kWh/m²/year 41.48 (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 1 317.75 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	742.68	557.3	436.07	222.07	89.38	0	0	0	0	250.19	516.55	761.05	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	233.26	175.04	136.96	69.75	28.07	0	0	0	0	78.58	162.24	239.03	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1122.93 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	1.49	1.11	0.87	0.44	0.18	0	0	0	0	0.5	1.03	1.52	

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 7.15 (215)

Water heating

Output from water heater (calculated above)

	169.42	148.58	154.28	135.85	131.36	114.82	107.85	121.69	122.52	140.99	152.16	164.52	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	87.25	76.52	79.45	69.96	67.65	59.13	55.54	62.67	63.1	72.61	78.36	84.73	

Total = Sum(219a)$_{1...12}$ = 856.96 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1122.93
Space heating fuel used, secondary		7.15
Water heating fuel used		856.96
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	229.78	(230a)
warm air heating system fans	118.96	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		348.74 (231)
Electricity for lighting		365.13 (232)

DER WorkSheet: New dwelling design stage

Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =	2700.91	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	582.8	(261)
Space heating (secondary)	(215) x		0.519	=	3.71	(263)
Water heating	(219) x		0.519	=	444.76	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1031.28	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	181	(267)
Electricity for lighting	(232) x		0.519	=	189.5	(268)
Total CO2, kg/year		sum of (265)…(271) =			1401.77	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			16.26	(273)
EI rating (section 14)					86	(274)

Predicted Energy Assessment

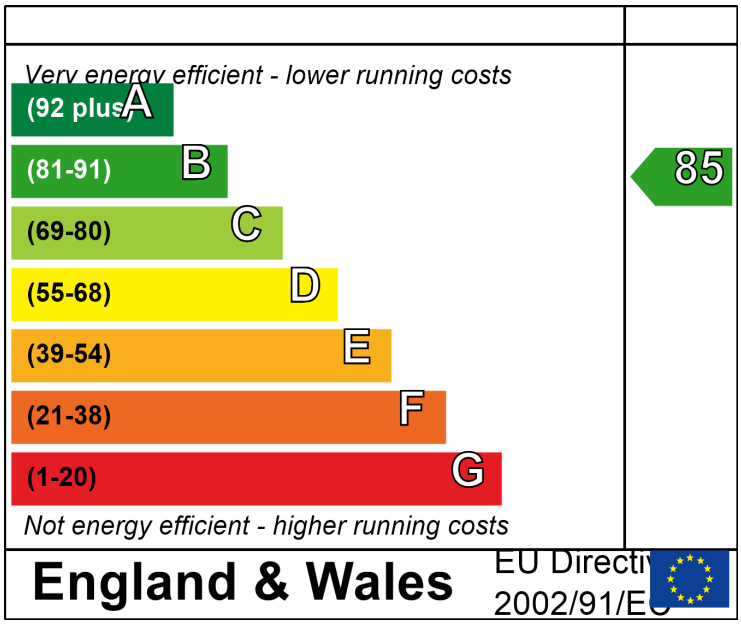
FLAT 11
43 London Street
Reading
RG1 4PS

Dwelling type: Ground floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 86.2 m²

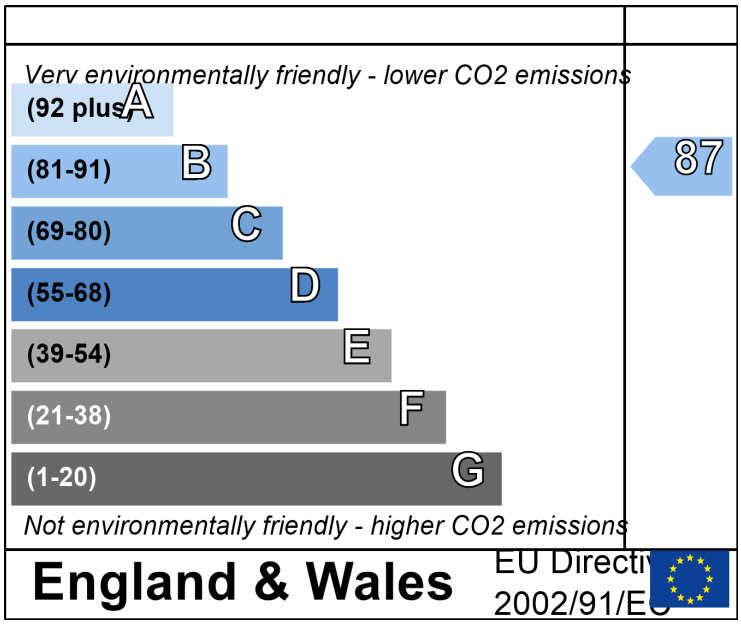
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 11

Address : FLAT 11, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	86.2	(1a) x	2.3	(2a) =	198.26	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	86.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		198.26	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.74	x	1/[1/(0.92)+ 0.04]	=	5.98			(27)
Windows Type 2			2.63	x	1/[1/(1.1)+ 0.04]	=	2.77			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 5			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 6			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 7			0.56	x	1/[1/(1.1)+ 0.04]	=	0.59			(27)
Floor			86.2	x	0.13	=	11.206	110	9482	(28)
Walls Type1	37.49	19.87	17.62	x	0.16	=	2.82	14	246.68	(29)
Walls Type2	14.49	0	14.49	x	0.14	=	2.03	9	130.41	(29)
Walls Type3	13.34	2.1	11.24	x	0.14	=	1.57	14	157.36	(29)
Walls Type4	14.49	0	14.49	x	0.16	=	2.32	14	202.86	(29)
Walls Type5	15.18	0	15.18	x	0.14	=	2.13	9	136.62	(29)
Roof	2.8	0	2.8	x	0.17	=	0.48	9	25.2	(30)
Total area of elements, m²			183.99							(31)
Party wall			17.71	x	0	=	0	20	354.2	(32)
Party ceiling			83.4					20	1668	(32b)
Internal wall **			145.82					9	1312.38	(32c)

SAP WorkSheet: New dwelling design stage

** 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) = 43.06 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13715.71 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 159.11 (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 27.6 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 70.65 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	23.4	23.11	22.83	21.39	21.11	19.68	19.68	19.39	20.25	21.11	21.68	22.25	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	94.05	93.77	93.48	92.05	91.76	90.33	90.33	90.04	90.9	91.76	92.33	92.91	

Average = Sum(39)$_{1...12}$ /12= 91.98 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.09	1.09	1.08	1.07	1.06	1.05	1.05	1.04	1.05	1.06	1.07	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 2.57 (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 95.24 (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=	104.76	100.95	97.14	93.33	89.52	85.71	85.71	89.52	93.33	97.14	100.95	104.76	

Total = Sum(44)$_{1...12}$ = 1142.87 (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=	155.36	135.88	140.21	122.24	117.29	101.22	93.79	107.63	108.91	126.93	138.55	150.46	

Total = Sum(45)$_{1...12}$ = 1498.48 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.3	20.38	21.03	18.34	17.59	15.18	14.07	16.14	16.34	19.04	20.78	22.57	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)
Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3: 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	169.42	148.58	154.28	135.85	131.36	114.82	107.85	121.69	122.52	140.99	152.16	164.52	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	169.42	148.58	154.28	135.85	131.36	114.82	107.85	121.69	122.52	140.99	152.16	164.52	

Output from water heater (annual)$_{1...12}$ 1664.04 (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=	51.66	45.18	46.62	40.65	39	33.65	31.19	35.79	36.21	42.2	46.07	50.03	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	154.2	154.2	154.2	154.2	154.2	154.2	154.2	154.2	154.2	154.2	154.2	154.2	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	51.69	45.91	37.34	28.27	21.13	17.84	19.27	25.05	33.63	42.7	49.83	53.12	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	346.14	349.73	340.68	321.41	297.08	274.22	258.95	255.36	264.41	283.68	308	330.86	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.99	52.99	52.99	52.99	52.99	52.99	52.99	52.99	52.99	52.99	52.99	52.99	(69)

Pumps and fans gains (Table 5a)

(70)m=	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	(71)

SAP WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=	69.43	67.23	62.66	56.45	52.42	46.74	41.92	48.1	50.3	56.73	63.98	67.24	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	583.54	579.15	556.96	522.41	486.92	455.09	436.43	444.8	464.62	499.39	538.11	567.51	(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	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x 0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x 0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x 0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x 0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x 0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x 0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x 0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x 0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x 0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x 0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
East	0.9x 0.77	x	6.74	x	19.64	x	0.51	x	0.8	=	37.43	(76)
East	0.9x 0.77	x	2.63	x	19.64	x	0.63	x	0.7	=	15.79	(76)
East	0.9x 0.77	x	0.56	x	19.64	x	0.63	x	0.7	=	3.36	(76)
East	0.9x 0.77	x	6.74	x	38.42	x	0.51	x	0.8	=	73.22	(76)
East	0.9x 0.77	x	2.63	x	38.42	x	0.63	x	0.7	=	30.88	(76)
East	0.9x 0.77	x	0.56	x	38.42	x	0.63	x	0.7	=	6.58	(76)
East	0.9x 0.77	x	6.74	x	63.27	x	0.51	x	0.8	=	120.58	(76)
East	0.9x 0.77	x	2.63	x	63.27	x	0.63	x	0.7	=	50.86	(76)
East	0.9x 0.77	x	0.56	x	63.27	x	0.63	x	0.7	=	10.83	(76)
East	0.9x 0.77	x	6.74	x	92.28	x	0.51	x	0.8	=	175.86	(76)
East	0.9x 0.77	x	2.63	x	92.28	x	0.63	x	0.7	=	74.17	(76)
East	0.9x 0.77	x	0.56	x	92.28	x	0.63	x	0.7	=	15.79	(76)
East	0.9x 0.77	x	6.74	x	113.09	x	0.51	x	0.8	=	215.52	(76)
East	0.9x 0.77	x	2.63	x	113.09	x	0.63	x	0.7	=	90.9	(76)
East	0.9x 0.77	x	0.56	x	113.09	x	0.63	x	0.7	=	19.36	(76)
East	0.9x 0.77	x	6.74	x	115.77	x	0.51	x	0.8	=	220.62	(76)
East	0.9x 0.77	x	2.63	x	115.77	x	0.63	x	0.7	=	93.05	(76)
East	0.9x 0.77	x	0.56	x	115.77	x	0.63	x	0.7	=	19.81	(76)
East	0.9x 0.77	x	6.74	x	110.22	x	0.51	x	0.8	=	210.04	(76)
East	0.9x 0.77	x	2.63	x	110.22	x	0.63	x	0.7	=	88.59	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	0.56	x	110.22	x	0.63	x	0.7	=	18.86	(76)
East	0.9x	0.77	x	6.74	x	94.68	x	0.51	x	0.8	=	180.42	(76)
East	0.9x	0.77	x	2.63	x	94.68	x	0.63	x	0.7	=	76.1	(76)
East	0.9x	0.77	x	0.56	x	94.68	x	0.63	x	0.7	=	16.2	(76)
East	0.9x	0.77	x	6.74	x	73.59	x	0.51	x	0.8	=	140.24	(76)
East	0.9x	0.77	x	2.63	x	73.59	x	0.63	x	0.7	=	59.15	(76)
East	0.9x	0.77	x	0.56	x	73.59	x	0.63	x	0.7	=	12.59	(76)
East	0.9x	0.77	x	6.74	x	45.59	x	0.51	x	0.8	=	86.88	(76)
East	0.9x	0.77	x	2.63	x	45.59	x	0.63	x	0.7	=	36.64	(76)
East	0.9x	0.77	x	0.56	x	45.59	x	0.63	x	0.7	=	7.8	(76)
East	0.9x	0.77	x	6.74	x	24.49	x	0.51	x	0.8	=	46.67	(76)
East	0.9x	0.77	x	2.63	x	24.49	x	0.63	x	0.7	=	19.68	(76)
East	0.9x	0.77	x	0.56	x	24.49	x	0.63	x	0.7	=	4.19	(76)
East	0.9x	0.77	x	6.74	x	16.15	x	0.51	x	0.8	=	30.78	(76)
East	0.9x	0.77	x	2.63	x	16.15	x	0.63	x	0.7	=	12.98	(76)
East	0.9x	0.77	x	0.56	x	16.15	x	0.63	x	0.7	=	2.76	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.87	x	46.75	x	0.63	x	0.7	=	41.01	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.87	x	76.57	x	0.63	x	0.7	=	67.16	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.87	x	97.53	x	0.63	x	0.7	=	85.55	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.87	x	110.23	x	0.63	x	0.7	=	96.69	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.87	x	114.87	x	0.63	x	0.7	=	100.75	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.87	x	110.55	x	0.63	x	0.7	=	96.96	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.87	x	108.01	x	0.63	x	0.7	=	94.74	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.87	x	104.89	x	0.63	x	0.7	=	92	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.87	x	101.89	x	0.63	x	0.7	=	89.36	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.87	x	82.59	x	0.63	x	0.7	=	72.44	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.87	x	55.42	x	0.63	x	0.7	=	48.61	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
South	0.9x	0.77	x	2.87	x	40.4	x	0.63	x	0.7	=	35.43	(78)
West	0.9x	0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(80)
West	0.9x	0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(80)
West	0.9x	0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(80)
West	0.9x	0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(80)
West	0.9x	0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(80)
West	0.9x	0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(80)
West	0.9x	0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(80)
West	0.9x	0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(80)
West	0.9x	0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(80)
West	0.9x	0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(80)
West	0.9x	0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.64	273.71	408.07	549.79	647.4	654.28	626.15	553.11	457.93	312.27	184.61	127.74	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	735.18	852.87	965.03	1072.2	1134.32	1109.37	1062.58	997.91	922.55	811.66	722.72	695.26	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.94	0.9	0.8	0.67	0.5	0.37	0.41	0.62	0.85	0.95	0.97	(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=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.94	0.89	0.79	0.64	0.46	0.33	0.36	0.58	0.83	0.94	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.96	0.94	0.89	0.79	0.65	0.48	0.34	0.38	0.6	0.84	0.94	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	709.36	802	860.6	850.79	736.21	528.14	362.73	377.67	550.37	679.97	680.69	674.76	(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)

SAP WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1537.56	1476.73	1322.75	1082.08	821.88	547.59	366.93	383.87	596.31	922.82	1251.54	1528.53	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	616.18	453.42	343.84	166.53	63.74	0	0	0	0	180.68	411.02	635.21	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2870.62 (98)

Space heating requirement in kWh/m²/year 33.3 (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 1 317.75 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	616.18	453.42	343.84	166.53	63.74	0	0	0	0	180.68	411.02	635.21	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	193.53	142.41	108	52.3	20.02	0	0	0	0	56.75	129.09	199.51	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 901.61 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	1.23	0.91	0.69	0.33	0.13	0	0	0	0	0.36	0.82	1.27	

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 5.74 (215)

Water heating

Output from water heater (calculated above)

	169.42	148.58	154.28	135.85	131.36	114.82	107.85	121.69	122.52	140.99	152.16	164.52	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	87.25	76.52	79.45	69.96	67.65	59.13	55.54	62.67	63.1	72.61	78.36	84.73	

Total = Sum(219a)$_{1...12}$ = 856.96 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		901.61
Space heating fuel used, secondary		5.74
Water heating fuel used		856.96
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	229.78	(230a)
warm air heating system fans	118.96	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		348.74 (231)
Electricity for lighting		365.13 (232)

SAP WorkSheet: New dwelling design stage

Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =	2478.18	(338)

10a. Fuel costs - individual heating systems:

		Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211)	x	13.19	x 0.01 =	118.92	(240)
Space heating - main system 2	(213)	x	0	x 0.01 =	0	(241)
Space heating - secondary	(215)	x	13.19	x 0.01 =	0.76	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	113.03	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	46	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	48.16	(250)
Additional standing charges (Table 12)					0	(251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)...(254) =	326.87	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	1.05	(257)
SAP rating (Section 12)	85.4	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

		Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x		0.519	=	467.94	(261)
Space heating (secondary)	(215)	x		0.519	=	2.98	(263)
Water heating	(219)	x		0.519	=	444.76	(264)
Space and water heating	(261) + (262) + (263) + (264) =					915.68	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	181	(267)
Electricity for lighting	(232)	x		0.519	=	189.5	(268)
Total CO2, kg/year	sum of (265)…(271) =					1286.17	(272)
CO2 emissions per m²	(272) ÷ (4) =					14.92	(273)
EI rating (section 14)						87	(274)

13a. Primary Energy

		Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x		3.07	=	2767.95	(261)
Space heating (secondary)	(215)	x		3.07	=	17.63	(263)
Energy for water heating	(219)	x		3.07	=	2630.86	(264)

SAP WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			5416.44	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	1070.63	(267)
Electricity for lighting	(232) x	0	=	1120.94	(268)
'Total Primary Energy	sum of (265)…(271) =			7608.01	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			88.26	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 11

Address : FLAT 11, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	86.2 (1a)	x	2.3 (2a)	=	198.26	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	86.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	198.26	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							3	x 10 =	30	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.15	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.4	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33

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=

0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=

0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			6.6	x1/[1/(1.4)+ 0.04]		=	8.75			(27)
Windows Type 2			2.57	x1/[1/(1.4)+ 0.04]		=	3.41			(27)
Windows Type 3			2.06	x1/[1/(1.4)+ 0.04]		=	2.73			(27)
Windows Type 4			2.06	x1/[1/(1.4)+ 0.04]		=	2.73			(27)
Windows Type 5			2.81	x1/[1/(1.4)+ 0.04]		=	3.73			(27)
Windows Type 6			2.81	x1/[1/(1.4)+ 0.04]		=	3.73			(27)
Windows Type 7			0.55	x1/[1/(1.4)+ 0.04]		=	0.73			(27)
Floor			86.2	x	0.13	=	11.206			(28)
Walls Type1	37.49	19.46	18.03	x	0.18	=	3.25			(29)
Walls Type2	14.49	0	14.49	x	0.18	=	2.61			(29)
Walls Type3	13.34	2.1	11.24	x	0.18	=	2.02			(29)
Walls Type4	14.49	0	14.49	x	0.18	=	2.61			(29)
Walls Type5	15.18	0	15.18	x	0.18	=	2.73			(29)
Roof	2.8	0	2.8	x	0.13	=	0.36			(30)
Total area of elements, m²			183.99							(31)
Party wall			17.71	x	0	=	0			(32)
Party ceiling			83.4							(32b)
Internal wall **			145.82							(32c)

TER WorkSheet: New dwelling design stage

** 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) =	52.69	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	13721.45	(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	9.2	(36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	61.89	(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=	36.91	36.75	36.59	35.84	35.7	35.04	35.04	34.92	35.29	35.7	35.98	36.28	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

(39)m=	98.8	98.63	98.47	97.72	97.58	96.93	96.93	96.81	97.18	97.58	97.87	98.16	

Average = Sum(39)$_{1...12}$ /12= 97.72 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	1.15	1.14	1.14	1.13	1.13	1.12	1.12	1.12	1.13	1.13	1.14	1.14	

Average = Sum(40)$_{1...12}$ /12= 1.13 (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 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1	2.57	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 *Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)*	95.24	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	104.76	100.95	97.14	93.33	89.52	85.71	85.71	89.52	93.33	97.14	100.95	104.76	

Total = Sum(44)$_{1...12}$ = 1142.87 (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=	155.36	135.88	140.21	122.24	117.29	101.22	93.79	107.63	108.91	126.93	138.55	150.46	

Total = Sum(45)$_{1...12}$ = 1498.48 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.3	20.38	21.03	18.34	17.59	15.18	14.07	16.14	16.34	19.04	20.78	22.57	(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):	1.55	(48)
Temperature factor from Table 2b	0.54	(49)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	0.84	(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)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	204.6	180.36	189.46	169.9	166.54	148.87	143.03	156.87	156.57	176.17	186.21	199.7	(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=	204.6	180.36	189.46	169.9	166.54	148.87	143.03	156.87	156.57	176.17	186.21	199.7	

Output from water heater (annual)$_{1...12}$ 2078.27 (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=	91.05	80.76	86.02	78.77	78.39	71.78	70.58	75.18	74.34	81.6	84.19	89.42	(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=	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	128.5	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.67	18.36	14.93	11.3	8.45	7.13	7.71	10.02	13.45	17.08	19.93	21.25	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	231.91	234.32	228.25	215.34	199.05	183.73	173.5	171.09	177.15	190.06	206.36	221.68	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	35.85	(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=	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	-102.8	(71)

TER WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=	122.38	120.18	115.61	109.4	105.37	99.69	94.87	101.05	103.25	109.67	116.93	120.19	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	439.51	437.41	423.35	400.6	377.42	355.11	340.62	346.71	358.4	381.37	407.77	427.66	(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	2.06	x	10.63	x	0.63	x	0.7	=	6.69	(74)
North	0.9x 0.77	x	2.06	x	20.32	x	0.63	x	0.7	=	12.79	(74)
North	0.9x 0.77	x	2.06	x	34.53	x	0.63	x	0.7	=	21.74	(74)
North	0.9x 0.77	x	2.06	x	55.46	x	0.63	x	0.7	=	34.92	(74)
North	0.9x 0.77	x	2.06	x	74.72	x	0.63	x	0.7	=	47.04	(74)
North	0.9x 0.77	x	2.06	x	79.99	x	0.63	x	0.7	=	50.36	(74)
North	0.9x 0.77	x	2.06	x	74.68	x	0.63	x	0.7	=	47.01	(74)
North	0.9x 0.77	x	2.06	x	59.25	x	0.63	x	0.7	=	37.3	(74)
North	0.9x 0.77	x	2.06	x	41.52	x	0.63	x	0.7	=	26.14	(74)
North	0.9x 0.77	x	2.06	x	24.19	x	0.63	x	0.7	=	15.23	(74)
North	0.9x 0.77	x	2.06	x	13.12	x	0.63	x	0.7	=	8.26	(74)
North	0.9x 0.77	x	2.06	x	8.86	x	0.63	x	0.7	=	5.58	(74)
East	0.9x 0.77	x	6.6	x	19.64	x	0.63	x	0.7	=	39.62	(76)
East	0.9x 0.77	x	2.57	x	19.64	x	0.63	x	0.7	=	15.43	(76)
East	0.9x 0.77	x	0.55	x	19.64	x	0.63	x	0.7	=	3.3	(76)
East	0.9x 0.77	x	6.6	x	38.42	x	0.63	x	0.7	=	77.5	(76)
East	0.9x 0.77	x	2.57	x	38.42	x	0.63	x	0.7	=	30.18	(76)
East	0.9x 0.77	x	0.55	x	38.42	x	0.63	x	0.7	=	6.46	(76)
East	0.9x 0.77	x	6.6	x	63.27	x	0.63	x	0.7	=	127.62	(76)
East	0.9x 0.77	x	2.57	x	63.27	x	0.63	x	0.7	=	49.7	(76)
East	0.9x 0.77	x	0.55	x	63.27	x	0.63	x	0.7	=	10.64	(76)
East	0.9x 0.77	x	6.6	x	92.28	x	0.63	x	0.7	=	186.13	(76)
East	0.9x 0.77	x	2.57	x	92.28	x	0.63	x	0.7	=	72.48	(76)
East	0.9x 0.77	x	0.55	x	92.28	x	0.63	x	0.7	=	15.51	(76)
East	0.9x 0.77	x	6.6	x	113.09	x	0.63	x	0.7	=	228.11	(76)
East	0.9x 0.77	x	2.57	x	113.09	x	0.63	x	0.7	=	88.83	(76)
East	0.9x 0.77	x	0.55	x	113.09	x	0.63	x	0.7	=	19.01	(76)
East	0.9x 0.77	x	6.6	x	115.77	x	0.63	x	0.7	=	233.51	(76)
East	0.9x 0.77	x	2.57	x	115.77	x	0.63	x	0.7	=	90.93	(76)
East	0.9x 0.77	x	0.55	x	115.77	x	0.63	x	0.7	=	19.46	(76)
East	0.9x 0.77	x	6.6	x	110.22	x	0.63	x	0.7	=	222.32	(76)
East	0.9x 0.77	x	2.57	x	110.22	x	0.63	x	0.7	=	86.57	(76)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	0.55	x	110.22	x	0.63	x	0.7	=	18.53	(76)
East	0.9x	0.77	x	6.6	x	94.68	x	0.63	x	0.7	=	190.97	(76)
East	0.9x	0.77	x	2.57	x	94.68	x	0.63	x	0.7	=	74.36	(76)
East	0.9x	0.77	x	0.55	x	94.68	x	0.63	x	0.7	=	15.91	(76)
East	0.9x	0.77	x	6.6	x	73.59	x	0.63	x	0.7	=	148.43	(76)
East	0.9x	0.77	x	2.57	x	73.59	x	0.63	x	0.7	=	57.8	(76)
East	0.9x	0.77	x	0.55	x	73.59	x	0.63	x	0.7	=	12.37	(76)
East	0.9x	0.77	x	6.6	x	45.59	x	0.63	x	0.7	=	91.96	(76)
East	0.9x	0.77	x	2.57	x	45.59	x	0.63	x	0.7	=	35.81	(76)
East	0.9x	0.77	x	0.55	x	45.59	x	0.63	x	0.7	=	7.66	(76)
East	0.9x	0.77	x	6.6	x	24.49	x	0.63	x	0.7	=	49.4	(76)
East	0.9x	0.77	x	2.57	x	24.49	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	0.55	x	24.49	x	0.63	x	0.7	=	4.12	(76)
East	0.9x	0.77	x	6.6	x	16.15	x	0.63	x	0.7	=	32.58	(76)
East	0.9x	0.77	x	2.57	x	16.15	x	0.63	x	0.7	=	12.69	(76)
East	0.9x	0.77	x	0.55	x	16.15	x	0.63	x	0.7	=	2.71	(76)
South	0.9x	0.77	x	2.06	x	46.75	x	0.63	x	0.7	=	29.43	(78)
South	0.9x	0.77	x	2.81	x	46.75	x	0.63	x	0.7	=	40.15	(78)
South	0.9x	0.77	x	2.06	x	76.57	x	0.63	x	0.7	=	48.2	(78)
South	0.9x	0.77	x	2.81	x	76.57	x	0.63	x	0.7	=	65.75	(78)
South	0.9x	0.77	x	2.06	x	97.53	x	0.63	x	0.7	=	61.4	(78)
South	0.9x	0.77	x	2.81	x	97.53	x	0.63	x	0.7	=	83.76	(78)
South	0.9x	0.77	x	2.06	x	110.23	x	0.63	x	0.7	=	69.4	(78)
South	0.9x	0.77	x	2.81	x	110.23	x	0.63	x	0.7	=	94.67	(78)
South	0.9x	0.77	x	2.06	x	114.87	x	0.63	x	0.7	=	72.32	(78)
South	0.9x	0.77	x	2.81	x	114.87	x	0.63	x	0.7	=	98.65	(78)
South	0.9x	0.77	x	2.06	x	110.55	x	0.63	x	0.7	=	69.6	(78)
South	0.9x	0.77	x	2.81	x	110.55	x	0.63	x	0.7	=	94.94	(78)
South	0.9x	0.77	x	2.06	x	108.01	x	0.63	x	0.7	=	68	(78)
South	0.9x	0.77	x	2.81	x	108.01	x	0.63	x	0.7	=	92.76	(78)
South	0.9x	0.77	x	2.06	x	104.89	x	0.63	x	0.7	=	66.04	(78)
South	0.9x	0.77	x	2.81	x	104.89	x	0.63	x	0.7	=	90.08	(78)
South	0.9x	0.77	x	2.06	x	101.89	x	0.63	x	0.7	=	64.14	(78)
South	0.9x	0.77	x	2.81	x	101.89	x	0.63	x	0.7	=	87.5	(78)
South	0.9x	0.77	x	2.06	x	82.59	x	0.63	x	0.7	=	51.99	(78)
South	0.9x	0.77	x	2.81	x	82.59	x	0.63	x	0.7	=	70.92	(78)
South	0.9x	0.77	x	2.06	x	55.42	x	0.63	x	0.7	=	34.89	(78)
South	0.9x	0.77	x	2.81	x	55.42	x	0.63	x	0.7	=	47.59	(78)
South	0.9x	0.77	x	2.06	x	40.4	x	0.63	x	0.7	=	25.43	(78)
South	0.9x	0.77	x	2.81	x	40.4	x	0.63	x	0.7	=	34.69	(78)
West	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)
West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.49	273.88	409.2	552.36	651.07	658.21	629.83	555.96	459.57	312.72	184.51	127.55	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	591	711.29	832.54	952.95	1028.49	1013.32	970.45	902.67	817.97	694.09	592.29	555.22	(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	0.78	0.59	0.44	0.49	0.74	0.95	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.84	20.04	20.32	20.66	20.88	20.98	21	20.99	20.93	20.61	20.16	19.8	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.96	19.96	19.97	19.97	19.97	19.98	19.98	19.98	19.98	19.97	19.97	19.97	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.96	0.88	0.72	0.51	0.34	0.38	0.66	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=	18.43	18.71	19.13	19.59	19.87	19.97	19.98	19.98	19.93	19.54	18.89	18.38	(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.93	19.18	19.55	19.97	20.23	20.33	20.34	20.34	20.28	19.92	19.34	18.88	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.93	19.18	19.55	19.97	20.23	20.33	20.34	20.34	20.28	19.92	19.34	18.88	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.99	0.98	0.96	0.88	0.74	0.54	0.37	0.42	0.69	0.93	0.99	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	587.13	699.91	797.32	842.12	757.7	543.17	361.08	378.68	562.07	642.63	583.8	552.49	(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)

TER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1445.63	1408.74	1285.33	1081.64	832.35	554.99	362.55	381.36	601.05	909.52	1198.01	1441.5	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	638.73	476.34	363.08	172.45	55.54	0	0	0	0	198.56	442.23	661.42	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3008.36 (98)

Space heating requirement in kWh/m²/year 34.9 (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)	638.73	476.34	363.08	172.45	55.54	0	0	0	0	198.56	442.23	661.42	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	683.13	509.45	388.32	184.44	59.4	0	0	0	0	212.37	472.98	707.4	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 3217.49 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	204.6	180.36	189.46	169.9	166.54	148.87	143.03	156.87	156.57	176.17	186.21	199.7	

Efficiency of water heater 79.8 (216)

(217)m=	87.65	87.29	86.52	84.85	82.23	79.8	79.8	79.8	79.8	85.13	87.04	87.77	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	233.43	206.63	218.97	200.22	202.52	186.55	179.24	196.58	196.2	206.93	213.93	227.53	

Total = Sum(219a)$_{1...12}$ = 2468.74 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3217.49	
Water heating fuel used		2468.74	
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		365.06	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		6126.3	(338)

TER WorkSheet: New dwelling design stage

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	=	694.98	(261)	
Space heating (secondary)	(215) x	0.519	=	0	(263)	
Water heating	(219) x	0.216	=	533.25	(264)	
Space and water heating	(261) + (262) + (263) + (264) =			1228.23	(265)	
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)	
Electricity for lighting	(232) x	0.519	=	189.47	(268)	
Total CO2, kg/year	sum of (265)…(271) =			1456.62	(272)	

TER = 24.73 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:28:00

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 56m²

Site Reference : 43LS **Plot Reference:** FLAT 12

Address : FLAT 12, 43 London Street, Reading, RG1 4PS

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)	27.78 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.59 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	0.95 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	3.72m²
Windows facing: South	1.16m²
Windows facing: West	1.75m²
Windows facing: North West	2.12m²
Windows facing: North East	2.12m²
Windows facing: North	1.14m²
Windows facing: East	2.81m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 12

Address : FLAT 12, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	56 (1a)	x	2.3 (2a)	=	128.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	56 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.8	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			3.72	x	1/[1/(0.92)+ 0.04]	=	3.3			(27)
Windows Type 2			1.16	x	1/[1/(0.92)+ 0.04]	=	1.03			(27)
Windows Type 3			1.75	x	1/[1/(1.1)+ 0.04]	=	1.84			(27)
Windows Type 4			2.12	x	1/[1/(1.1)+ 0.04]	=	2.23			(27)
Windows Type 5			2.12	x	1/[1/(1.1)+ 0.04]	=	2.23			(27)
Windows Type 6			1.14	x	1/[1/(1.1)+ 0.04]	=	1.2			(27)
Windows Type 7			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Floor			37.5	x	0.16	=	6	20	750	(28)
Walls Type1	49.32	14.82	34.5	x	0.16	=	5.52	14	483	(29)
Walls Type2	9.43	2.1	7.33	x	0.14	=	1.03	14	102.62	(29)
Walls Type3	11.4	0	11.4	x	0.14	=	1.6	9	102.6	(29)
Total area of elements, m²			107.65							(31)
Party wall			11.73	x	0	=	0	20	234.6	(32)
Party floor			18.5					30	555	(32a)
Party ceiling			56					20	1120	(32b)
Internal wall **			98.9					9	890.1	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.64 (33)

DER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4237.92 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 75.68 (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 16.15 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 45.79 (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=	15.38	15.2	15.01	14.08	13.89	12.96	12.96	12.78	13.34	13.89	14.27	14.64	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.17	60.98	60.8	59.87	59.68	58.75	58.75	58.56	59.12	59.68	60.05	60.42	

Average = Sum(39)$_{1...12}$ /12= 59.82 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.09	1.09	1.09	1.07	1.07	1.05	1.05	1.05	1.06	1.07	1.07	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 1.87 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 78.53 (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=	86.38	83.24	80.1	76.96	73.82	70.68	70.68	73.82	76.96	80.1	83.24	86.38	

Total = Sum(44)$_{1...12}$ = 942.38 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	128.11	112.04	115.62	100.8	96.72	83.46	77.34	88.75	89.81	104.66	114.25	124.06	

Total = Sum(45)$_{1...12}$ = 1235.61 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.22	16.81	17.34	15.12	14.51	12.52	11.6	13.31	13.47	15.7	17.14	18.61	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

DER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	142.17	124.74	129.68	114.41	110.78	97.07	91.4	102.81	103.42	118.72	127.85	138.13	(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=	142.17	124.74	129.68	114.41	110.78	97.07	91.4	102.81	103.42	118.72	127.85	138.13	

Output from water heater (annual)$_{1...12}$ 1401.17 (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=	42.6	37.25	38.44	33.52	32.16	27.75	25.72	29.51	29.86	34.8	37.99	41.25	(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=	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.51	12.89	10.48	7.93	5.93	5.01	5.41	7.03	9.44	11.99	13.99	14.91	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	162.76	164.45	160.19	151.13	139.69	128.94	121.76	120.07	124.33	133.39	144.83	155.58	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	(71)

Water heating gains (Table 5)

(72)m=	57.25	55.44	51.67	46.55	43.22	38.54	34.56	39.66	41.47	46.77	52.76	55.45	(72)

DER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	293.25	291.5	281.07	264.34	247.58	231.22	220.46	225.5	233.97	250.88	270.3	284.66	(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	1.14	x	10.63	x	0.63	x	0.7	=	3.7	(74)
North	0.9x 0.77	x	1.14	x	20.32	x	0.63	x	0.7	=	7.08	(74)
North	0.9x 0.77	x	1.14	x	34.53	x	0.63	x	0.7	=	12.03	(74)
North	0.9x 0.77	x	1.14	x	55.46	x	0.63	x	0.7	=	19.32	(74)
North	0.9x 0.77	x	1.14	x	74.72	x	0.63	x	0.7	=	26.03	(74)
North	0.9x 0.77	x	1.14	x	79.99	x	0.63	x	0.7	=	27.87	(74)
North	0.9x 0.77	x	1.14	x	74.68	x	0.63	x	0.7	=	26.02	(74)
North	0.9x 0.77	x	1.14	x	59.25	x	0.63	x	0.7	=	20.64	(74)
North	0.9x 0.77	x	1.14	x	41.52	x	0.63	x	0.7	=	14.46	(74)
North	0.9x 0.77	x	1.14	x	24.19	x	0.63	x	0.7	=	8.43	(74)
North	0.9x 0.77	x	1.14	x	13.12	x	0.63	x	0.7	=	4.57	(74)
North	0.9x 0.77	x	1.14	x	8.86	x	0.63	x	0.7	=	3.09	(74)
Northeast	0.9x 0.77	x	2.12	x	11.28	x	0.63	x	0.7	=	7.31	(75)
Northeast	0.9x 0.77	x	2.12	x	22.97	x	0.63	x	0.7	=	14.88	(75)
Northeast	0.9x 0.77	x	2.12	x	41.38	x	0.63	x	0.7	=	26.81	(75)
Northeast	0.9x 0.77	x	2.12	x	67.96	x	0.63	x	0.7	=	44.03	(75)
Northeast	0.9x 0.77	x	2.12	x	91.35	x	0.63	x	0.7	=	59.18	(75)
Northeast	0.9x 0.77	x	2.12	x	97.38	x	0.63	x	0.7	=	63.1	(75)
Northeast	0.9x 0.77	x	2.12	x	91.1	x	0.63	x	0.7	=	59.02	(75)
Northeast	0.9x 0.77	x	2.12	x	72.63	x	0.63	x	0.7	=	47.05	(75)
Northeast	0.9x 0.77	x	2.12	x	50.42	x	0.63	x	0.7	=	32.67	(75)
Northeast	0.9x 0.77	x	2.12	x	28.07	x	0.63	x	0.7	=	18.18	(75)
Northeast	0.9x 0.77	x	2.12	x	14.2	x	0.63	x	0.7	=	9.2	(75)
Northeast	0.9x 0.77	x	2.12	x	9.21	x	0.63	x	0.7	=	5.97	(75)
East	0.9x 0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(76)
East	0.9x 0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(76)
East	0.9x 0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(76)
East	0.9x 0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(76)
East	0.9x 0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(76)
East	0.9x 0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(76)
East	0.9x 0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(76)
East	0.9x 0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(76)
East	0.9x 0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(76)
East	0.9x 0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(76)
East	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(76)
South	0.9x	0.77	x	1.16	x	46.75	x	0.51	x	0.8	=	15.33	(78)
South	0.9x	0.77	x	1.16	x	76.57	x	0.51	x	0.8	=	25.11	(78)
South	0.9x	0.77	x	1.16	x	97.53	x	0.51	x	0.8	=	31.99	(78)
South	0.9x	0.77	x	1.16	x	110.23	x	0.51	x	0.8	=	36.16	(78)
South	0.9x	0.77	x	1.16	x	114.87	x	0.51	x	0.8	=	37.68	(78)
South	0.9x	0.77	x	1.16	x	110.55	x	0.51	x	0.8	=	36.26	(78)
South	0.9x	0.77	x	1.16	x	108.01	x	0.51	x	0.8	=	35.43	(78)
South	0.9x	0.77	x	1.16	x	104.89	x	0.51	x	0.8	=	34.4	(78)
South	0.9x	0.77	x	1.16	x	101.89	x	0.51	x	0.8	=	33.42	(78)
South	0.9x	0.77	x	1.16	x	82.59	x	0.51	x	0.8	=	27.09	(78)
South	0.9x	0.77	x	1.16	x	55.42	x	0.51	x	0.8	=	18.18	(78)
South	0.9x	0.77	x	1.16	x	40.4	x	0.51	x	0.8	=	13.25	(78)
West	0.9x	0.77	x	3.72	x	19.64	x	0.51	x	0.8	=	20.66	(80)
West	0.9x	0.77	x	1.75	x	19.64	x	0.63	x	0.7	=	10.5	(80)
West	0.9x	0.77	x	3.72	x	38.42	x	0.51	x	0.8	=	40.41	(80)
West	0.9x	0.77	x	1.75	x	38.42	x	0.63	x	0.7	=	20.55	(80)
West	0.9x	0.77	x	3.72	x	63.27	x	0.51	x	0.8	=	66.55	(80)
West	0.9x	0.77	x	1.75	x	63.27	x	0.63	x	0.7	=	33.84	(80)
West	0.9x	0.77	x	3.72	x	92.28	x	0.51	x	0.8	=	97.06	(80)
West	0.9x	0.77	x	1.75	x	92.28	x	0.63	x	0.7	=	49.35	(80)
West	0.9x	0.77	x	3.72	x	113.09	x	0.51	x	0.8	=	118.95	(80)
West	0.9x	0.77	x	1.75	x	113.09	x	0.63	x	0.7	=	60.48	(80)
West	0.9x	0.77	x	3.72	x	115.77	x	0.51	x	0.8	=	121.77	(80)
West	0.9x	0.77	x	1.75	x	115.77	x	0.63	x	0.7	=	61.92	(80)
West	0.9x	0.77	x	3.72	x	110.22	x	0.51	x	0.8	=	115.93	(80)
West	0.9x	0.77	x	1.75	x	110.22	x	0.63	x	0.7	=	58.95	(80)
West	0.9x	0.77	x	3.72	x	94.68	x	0.51	x	0.8	=	99.58	(80)
West	0.9x	0.77	x	1.75	x	94.68	x	0.63	x	0.7	=	50.63	(80)
West	0.9x	0.77	x	3.72	x	73.59	x	0.51	x	0.8	=	77.4	(80)
West	0.9x	0.77	x	1.75	x	73.59	x	0.63	x	0.7	=	39.36	(80)
West	0.9x	0.77	x	3.72	x	45.59	x	0.51	x	0.8	=	47.95	(80)
West	0.9x	0.77	x	1.75	x	45.59	x	0.63	x	0.7	=	24.38	(80)
West	0.9x	0.77	x	3.72	x	24.49	x	0.51	x	0.8	=	25.76	(80)
West	0.9x	0.77	x	1.75	x	24.49	x	0.63	x	0.7	=	13.1	(80)
West	0.9x	0.77	x	3.72	x	16.15	x	0.51	x	0.8	=	16.99	(80)
West	0.9x	0.77	x	1.75	x	16.15	x	0.63	x	0.7	=	8.64	(80)
Northwest	0.9x	0.77	x	2.12	x	11.28	x	0.63	x	0.7	=	7.31	(81)
Northwest	0.9x	0.77	x	2.12	x	22.97	x	0.63	x	0.7	=	14.88	(81)
Northwest	0.9x	0.77	x	2.12	x	41.38	x	0.63	x	0.7	=	26.81	(81)

DER WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	2.12	x	67.96	x	0.63	x	0.7	=	44.03	(81)
Northwest	0.9x	0.77	x	2.12	x	91.35	x	0.63	x	0.7	=	59.18	(81)
Northwest	0.9x	0.77	x	2.12	x	97.38	x	0.63	x	0.7	=	63.1	(81)
Northwest	0.9x	0.77	x	2.12	x	91.1	x	0.63	x	0.7	=	59.02	(81)
Northwest	0.9x	0.77	x	2.12	x	72.63	x	0.63	x	0.7	=	47.05	(81)
Northwest	0.9x	0.77	x	2.12	x	50.42	x	0.63	x	0.7	=	32.67	(81)
Northwest	0.9x	0.77	x	2.12	x	28.07	x	0.63	x	0.7	=	18.18	(81)
Northwest	0.9x	0.77	x	2.12	x	14.2	x	0.63	x	0.7	=	9.2	(81)
Northwest	0.9x	0.77	x	2.12	x	9.21	x	0.63	x	0.7	=	5.97	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	81.69	155.91	252.37	369.2	458.63	473.42	449.02	380.68	293.17	183.37	101.03	67.77	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	374.93	447.41	533.44	633.54	706.21	704.64	669.48	606.17	527.14	434.25	371.33	352.44	(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=	0.93	0.9	0.85	0.74	0.61	0.47	0.36	0.4	0.61	0.81	0.91	0.94	(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=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.93	0.9	0.84	0.73	0.59	0.44	0.32	0.37	0.58	0.8	0.9	0.94	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46	(90)

fLA = Living area ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.69	20.69	20.69	20.7	20.7	20.7	20.7	20.71	20.7	20.7	20.7	20.7	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.69	20.69	20.69	20.7	20.7	20.7	20.7	20.71	20.7	20.7	20.7	20.7	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.93	0.9	0.84	0.73	0.6	0.45	0.34	0.38	0.59	0.8	0.9	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	349.07	402.29	448.28	465.63	422.69	318.02	226.47	232.19	310.71	348.51	335.84	330.86	(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=	1002.7	963.12	862.97	706.37	537.13	358.66	241.16	252.17	390.39	602.78	816.6	996.78	(97)

DER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	486.31	376.88	308.53	173.34	85.15	0	0	0	0	189.18	346.15	495.44

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2460.97 (98)

Space heating requirement in kWh/m²/year 43.95 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 509.18 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	486.31	376.88	308.53	173.34	85.15	0	0	0	0	189.18	346.15	495.44	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	95.51	74.02	60.59	34.04	16.72	0	0	0	0	37.15	67.98	97.3	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 483.32 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	142.17	124.74	129.68	114.41	110.78	97.07	91.4	102.81	103.42	118.72	127.85	138.13

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	73.21	64.24	66.78	58.92	57.05	49.99	47.07	52.95	53.26	61.14	65.84	71.13

Total = Sum(219a)$_{1...12}$ = 721.58 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		483.32
Water heating fuel used		721.58
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	143.39	(230a)
warm air heating system fans	77.28	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		220.67 (231)
Electricity for lighting		256.25 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1681.82 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

DER WorkSheet: New dwelling design stage

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.519	=	250.84	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	374.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =				625.34	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	114.53	(267)
Electricity for lighting	(232)	x	0.519	=	132.99	(268)
Total CO2, kg/year		sum of (265)…(271) =			872.87	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			15.59	(273)
EI rating (section 14)					88	(274)

Predicted Energy Assessment

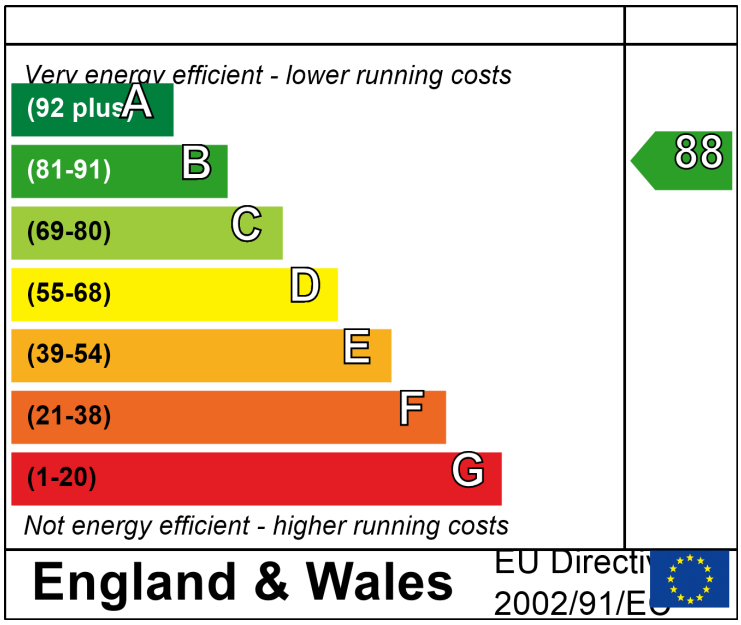
FLAT 12
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 56 m²

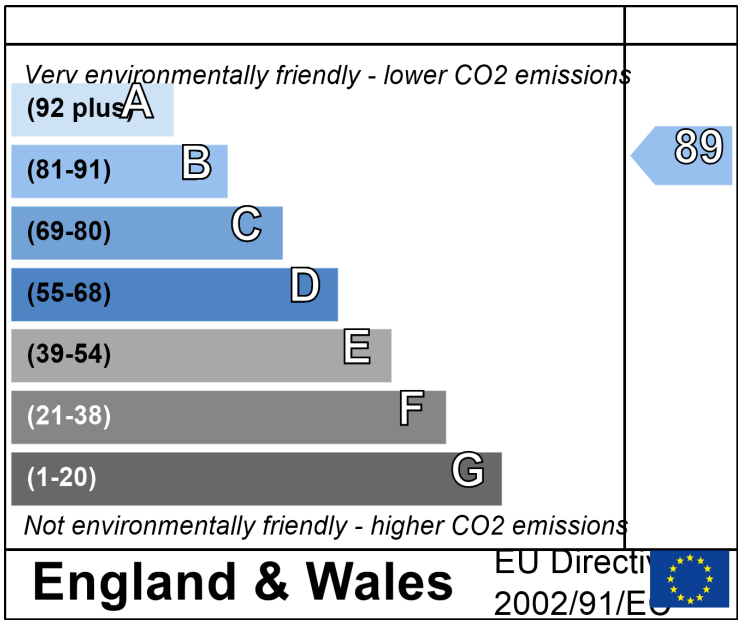
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 12

Address : FLAT 12, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	56	(1a) x	2.3	(2a) =	128.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	56	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		128.8	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			3.72	x	1/[1/(0.92)+ 0.04]	=	3.3			(27)
Windows Type 2			1.16	x	1/[1/(0.92)+ 0.04]	=	1.03			(27)
Windows Type 3			1.75	x	1/[1/(1.1)+ 0.04]	=	1.84			(27)
Windows Type 4			2.12	x	1/[1/(1.1)+ 0.04]	=	2.23			(27)
Windows Type 5			2.12	x	1/[1/(1.1)+ 0.04]	=	2.23			(27)
Windows Type 6			1.14	x	1/[1/(1.1)+ 0.04]	=	1.2			(27)
Windows Type 7			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Floor			37.5	x	0.16	=	6	20	750	(28)
Walls Type1	49.32	14.82	34.5	x	0.16	=	5.52	14	483	(29)
Walls Type2	9.43	2.1	7.33	x	0.14	=	1.03	14	102.62	(29)
Walls Type3	11.4	0	11.4	x	0.14	=	1.6	9	102.6	(29)
Total area of elements, m²			107.65							(31)
Party wall			11.73	x	0	=	0	20	234.6	(32)
Party floor			18.5					30	555	(32a)
Party ceiling			56					20	1120	(32b)
Internal wall **			98.9					9	890.1	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.64 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4237.92 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 75.68 (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 16.15 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 45.79 (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=	15.38	15.2	15.01	14.08	13.89	12.96	12.96	12.78	13.34	13.89	14.27	14.64	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.17	60.98	60.8	59.87	59.68	58.75	58.75	58.56	59.12	59.68	60.05	60.42	

Average = Sum(39)$_{1...12}$ /12= 59.82 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.09	1.09	1.09	1.07	1.07	1.05	1.05	1.05	1.06	1.07	1.07	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 1.87 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 78.53 (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=	86.38	83.24	80.1	76.96	73.82	70.68	70.68	73.82	76.96	80.1	83.24	86.38	

Total = Sum(44)$_{1...12}$ = 942.38 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	128.11	112.04	115.62	100.8	96.72	83.46	77.34	88.75	89.81	104.66	114.25	124.06	

Total = Sum(45)$_{1...12}$ = 1235.61 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.22	16.81	17.34	15.12	14.51	12.52	11.6	13.31	13.47	15.7	17.14	18.61	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

SAP WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	142.17	124.74	129.68	114.41	110.78	97.07	91.4	102.81	103.42	118.72	127.85	138.13	(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=	142.17	124.74	129.68	114.41	110.78	97.07	91.4	102.81	103.42	118.72	127.85	138.13	

Output from water heater (annual)$_{1...12}$ 1401.17 (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=	42.6	37.25	38.44	33.52	32.16	27.75	25.72	29.51	29.86	34.8	37.99	41.25	(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=	112	112	112	112	112	112	112	112	112	112	112	112	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	36.28	32.22	26.2	19.84	14.83	12.52	13.53	17.58	23.6	29.97	34.97	37.28	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	242.92	245.44	239.09	225.57	208.5	192.45	181.74	179.21	185.57	199.09	216.16	232.21	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48.07	48.07	48.07	48.07	48.07	48.07	48.07	48.07	48.07	48.07	48.07	48.07	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	7.73	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	(71)

Water heating gains (Table 5)

(72)m=	57.25	55.44	51.67	46.55	43.22	38.54	34.56	39.66	41.47	46.77	52.76	55.45	(72)

SAP WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	429.58	426.23	410.09	385.08	359.68	336.64	322.95	329.59	343.77	368.96	397.02	418.06

(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	1.14		10.63		0.63		0.7	=	3.7	(74)
North	0.9x	0.77	1.14		20.32		0.63		0.7	=	7.08	(74)
North	0.9x	0.77	1.14		34.53		0.63		0.7	=	12.03	(74)
North	0.9x	0.77	1.14		55.46		0.63		0.7	=	19.32	(74)
North	0.9x	0.77	1.14		74.72		0.63		0.7	=	26.03	(74)
North	0.9x	0.77	1.14		79.99		0.63		0.7	=	27.87	(74)
North	0.9x	0.77	1.14		74.68		0.63		0.7	=	26.02	(74)
North	0.9x	0.77	1.14		59.25		0.63		0.7	=	20.64	(74)
North	0.9x	0.77	1.14		41.52		0.63		0.7	=	14.46	(74)
North	0.9x	0.77	1.14		24.19		0.63		0.7	=	8.43	(74)
North	0.9x	0.77	1.14		13.12		0.63		0.7	=	4.57	(74)
North	0.9x	0.77	1.14		8.86		0.63		0.7	=	3.09	(74)
Northeast	0.9x	0.77	2.12		11.28		0.63		0.7	=	7.31	(75)
Northeast	0.9x	0.77	2.12		22.97		0.63		0.7	=	14.88	(75)
Northeast	0.9x	0.77	2.12		41.38		0.63		0.7	=	26.81	(75)
Northeast	0.9x	0.77	2.12		67.96		0.63		0.7	=	44.03	(75)
Northeast	0.9x	0.77	2.12		91.35		0.63		0.7	=	59.18	(75)
Northeast	0.9x	0.77	2.12		97.38		0.63		0.7	=	63.1	(75)
Northeast	0.9x	0.77	2.12		91.1		0.63		0.7	=	59.02	(75)
Northeast	0.9x	0.77	2.12		72.63		0.63		0.7	=	47.05	(75)
Northeast	0.9x	0.77	2.12		50.42		0.63		0.7	=	32.67	(75)
Northeast	0.9x	0.77	2.12		28.07		0.63		0.7	=	18.18	(75)
Northeast	0.9x	0.77	2.12		14.2		0.63		0.7	=	9.2	(75)
Northeast	0.9x	0.77	2.12		9.21		0.63		0.7	=	5.97	(75)
East	0.9x	0.77	2.81		19.64		0.63		0.7	=	16.87	(76)
East	0.9x	0.77	2.81		38.42		0.63		0.7	=	32.99	(76)
East	0.9x	0.77	2.81		63.27		0.63		0.7	=	54.34	(76)
East	0.9x	0.77	2.81		92.28		0.63		0.7	=	79.25	(76)
East	0.9x	0.77	2.81		113.09		0.63		0.7	=	97.12	(76)
East	0.9x	0.77	2.81		115.77		0.63		0.7	=	99.42	(76)
East	0.9x	0.77	2.81		110.22		0.63		0.7	=	94.65	(76)
East	0.9x	0.77	2.81		94.68		0.63		0.7	=	81.31	(76)
East	0.9x	0.77	2.81		73.59		0.63		0.7	=	63.2	(76)
East	0.9x	0.77	2.81		45.59		0.63		0.7	=	39.15	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(76)
East	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(76)
South	0.9x	0.77	x	1.16	x	46.75	x	0.51	x	0.8	=	15.33	(78)
South	0.9x	0.77	x	1.16	x	76.57	x	0.51	x	0.8	=	25.11	(78)
South	0.9x	0.77	x	1.16	x	97.53	x	0.51	x	0.8	=	31.99	(78)
South	0.9x	0.77	x	1.16	x	110.23	x	0.51	x	0.8	=	36.16	(78)
South	0.9x	0.77	x	1.16	x	114.87	x	0.51	x	0.8	=	37.68	(78)
South	0.9x	0.77	x	1.16	x	110.55	x	0.51	x	0.8	=	36.26	(78)
South	0.9x	0.77	x	1.16	x	108.01	x	0.51	x	0.8	=	35.43	(78)
South	0.9x	0.77	x	1.16	x	104.89	x	0.51	x	0.8	=	34.4	(78)
South	0.9x	0.77	x	1.16	x	101.89	x	0.51	x	0.8	=	33.42	(78)
South	0.9x	0.77	x	1.16	x	82.59	x	0.51	x	0.8	=	27.09	(78)
South	0.9x	0.77	x	1.16	x	55.42	x	0.51	x	0.8	=	18.18	(78)
South	0.9x	0.77	x	1.16	x	40.4	x	0.51	x	0.8	=	13.25	(78)
West	0.9x	0.77	x	3.72	x	19.64	x	0.51	x	0.8	=	20.66	(80)
West	0.9x	0.77	x	1.75	x	19.64	x	0.63	x	0.7	=	10.5	(80)
West	0.9x	0.77	x	3.72	x	38.42	x	0.51	x	0.8	=	40.41	(80)
West	0.9x	0.77	x	1.75	x	38.42	x	0.63	x	0.7	=	20.55	(80)
West	0.9x	0.77	x	3.72	x	63.27	x	0.51	x	0.8	=	66.55	(80)
West	0.9x	0.77	x	1.75	x	63.27	x	0.63	x	0.7	=	33.84	(80)
West	0.9x	0.77	x	3.72	x	92.28	x	0.51	x	0.8	=	97.06	(80)
West	0.9x	0.77	x	1.75	x	92.28	x	0.63	x	0.7	=	49.35	(80)
West	0.9x	0.77	x	3.72	x	113.09	x	0.51	x	0.8	=	118.95	(80)
West	0.9x	0.77	x	1.75	x	113.09	x	0.63	x	0.7	=	60.48	(80)
West	0.9x	0.77	x	3.72	x	115.77	x	0.51	x	0.8	=	121.77	(80)
West	0.9x	0.77	x	1.75	x	115.77	x	0.63	x	0.7	=	61.92	(80)
West	0.9x	0.77	x	3.72	x	110.22	x	0.51	x	0.8	=	115.93	(80)
West	0.9x	0.77	x	1.75	x	110.22	x	0.63	x	0.7	=	58.95	(80)
West	0.9x	0.77	x	3.72	x	94.68	x	0.51	x	0.8	=	99.58	(80)
West	0.9x	0.77	x	1.75	x	94.68	x	0.63	x	0.7	=	50.63	(80)
West	0.9x	0.77	x	3.72	x	73.59	x	0.51	x	0.8	=	77.4	(80)
West	0.9x	0.77	x	1.75	x	73.59	x	0.63	x	0.7	=	39.36	(80)
West	0.9x	0.77	x	3.72	x	45.59	x	0.51	x	0.8	=	47.95	(80)
West	0.9x	0.77	x	1.75	x	45.59	x	0.63	x	0.7	=	24.38	(80)
West	0.9x	0.77	x	3.72	x	24.49	x	0.51	x	0.8	=	25.76	(80)
West	0.9x	0.77	x	1.75	x	24.49	x	0.63	x	0.7	=	13.1	(80)
West	0.9x	0.77	x	3.72	x	16.15	x	0.51	x	0.8	=	16.99	(80)
West	0.9x	0.77	x	1.75	x	16.15	x	0.63	x	0.7	=	8.64	(80)
Northwest	0.9x	0.77	x	2.12	x	11.28	x	0.63	x	0.7	=	7.31	(81)
Northwest	0.9x	0.77	x	2.12	x	22.97	x	0.63	x	0.7	=	14.88	(81)
Northwest	0.9x	0.77	x	2.12	x	41.38	x	0.63	x	0.7	=	26.81	(81)

SAP WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	2.12	x	67.96	x	0.63	x	0.7	=	44.03	(81)
Northwest	0.9x	0.77	x	2.12	x	91.35	x	0.63	x	0.7	=	59.18	(81)
Northwest	0.9x	0.77	x	2.12	x	97.38	x	0.63	x	0.7	=	63.1	(81)
Northwest	0.9x	0.77	x	2.12	x	91.1	x	0.63	x	0.7	=	59.02	(81)
Northwest	0.9x	0.77	x	2.12	x	72.63	x	0.63	x	0.7	=	47.05	(81)
Northwest	0.9x	0.77	x	2.12	x	50.42	x	0.63	x	0.7	=	32.67	(81)
Northwest	0.9x	0.77	x	2.12	x	28.07	x	0.63	x	0.7	=	18.18	(81)
Northwest	0.9x	0.77	x	2.12	x	14.2	x	0.63	x	0.7	=	9.2	(81)
Northwest	0.9x	0.77	x	2.12	x	9.21	x	0.63	x	0.7	=	5.97	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	81.69	155.91	252.37	369.2	458.63	473.42	449.02	380.68	293.17	183.37	101.03	67.77	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	511.26	582.13	662.46	754.28	818.31	810.06	771.97	710.26	636.94	552.32	498.05	485.83	(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=	0.89	0.85	0.79	0.68	0.56	0.42	0.32	0.35	0.53	0.74	0.85	0.89	(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=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.88	0.84	0.78	0.67	0.53	0.39	0.28	0.32	0.51	0.72	0.84	0.89	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.45	20.46	20.46	20.47	20.47	20.48	20.48	20.48	20.47	20.47	20.46	20.46	(90)

fLA = Living area ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.69	20.69	20.69	20.7	20.7	20.7	20.7	20.71	20.7	20.7	20.7	20.7	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.69	20.69	20.69	20.7	20.7	20.7	20.7	20.71	20.7	20.7	20.7	20.7	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.88	0.85	0.78	0.67	0.54	0.4	0.3	0.33	0.52	0.73	0.85	0.89	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	450.8	492.12	517.93	508.96	444.56	326.76	229.98	237.28	330.23	402.22	420.92	433.19	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1002.7	963.12	862.97	706.37	537.13	358.66	241.16	252.17	390.39	602.78	816.6	996.78	(97)

SAP WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	410.61	316.51	256.71	142.14	68.87	0	0	0	0	149.21	284.9	419.31

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2048.27 (98)

Space heating requirement in kWh/m²/year 36.58 (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 1 509.18 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	410.61	316.51	256.71	142.14	68.87	0	0	0	0	149.21	284.9	419.31	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	80.64	62.16	50.42	27.92	13.53	0	0	0	0	29.3	55.95	82.35	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 402.27 (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)

	142.17	124.74	129.68	114.41	110.78	97.07	91.4	102.81	103.42	118.72	127.85	138.13

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	73.21	64.24	66.78	58.92	57.05	49.99	47.07	52.95	53.26	61.14	65.84	71.13

Total = Sum(219a)$_{1...12}$ = 721.58 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		402.27
Water heating fuel used		721.58
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	143.39	(230a)
warm air heating system fans	77.28	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		220.67 (231)
Electricity for lighting		256.25 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1600.77 (338)

10a. Fuel costs - individual heating systems:

SAP WorkSheet: New dwelling design stage

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		13.19	x 0.01 =	53.06	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	95.18	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	29.11	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	33.8	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				211.14	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.88	(257)
SAP rating (Section 12)	87.75	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	208.78	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	374.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =				583.28	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	114.53	(267)
Electricity for lighting	(232) x		0.519	=	132.99	(268)
Total CO2, kg/year	sum of (265)...(271) =				830.8	(272)
CO2 emissions per m²	(272) ÷ (4) =				14.84	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		3.07	=	1234.96	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2215.26	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3450.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	677.45	(267)

SAP WorkSheet: New dwelling design stage

Electricity for lighting	(232)	x	0	=	786.69 (268)
‘Total Primary Energy			sum of (265)…(271) =		4914.36 (272)
Primary energy kWh/m²/year			(272) ÷ (4) =		87.76 (273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 12

Address : FLAT 12, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	56 (1a)	x	2.3 (2a)	=	128.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	56 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.8	(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							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) =	0.16	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.35	0.35	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33

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=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			2.99	x1/[1/(1.4)+ 0.04]		=	3.96			(27)
Windows Type 2			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 3			1.41	x1/[1/(1.4)+ 0.04]		=	1.87			(27)
Windows Type 4			1.7	x1/[1/(1.4)+ 0.04]		=	2.25			(27)
Windows Type 5			1.7	x1/[1/(1.4)+ 0.04]		=	2.25			(27)
Windows Type 6			0.92	x1/[1/(1.4)+ 0.04]		=	1.22			(27)
Windows Type 7			2.26	x1/[1/(1.4)+ 0.04]		=	3			(27)
Floor			37.5	x	0.13	=	4.875			(28)
Walls Type1	49.32	11.91	37.41	x	0.18	=	6.73			(29)
Walls Type2	9.43	2.1	7.33	x	0.18	=	1.32			(29)
Walls Type3	11.4	0	11.4	x	0.18	=	2.05			(29)
Total area of elements, m²			107.65							(31)
Party wall			11.73	x	0	=	0			(32)
Party floor			18.5							(32a)
Party ceiling			56							(32b)
Internal wall **			98.9							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.87 (33)

TER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4278.66 (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 5.38 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 38.25 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	24.03	23.92	23.82	23.32	23.23	22.8	22.8	22.72	22.96	23.23	23.42	23.61	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	62.28	62.18	62.07	61.57	61.48	61.05	61.05	60.97	61.21	61.48	61.67	61.87	

Average = Sum(39)$_{1...12}$ /12= 61.57 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.11	1.11	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.1	

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 1.87 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 78.53 (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=	86.38	83.24	80.1	76.96	73.82	70.68	70.68	73.82	76.96	80.1	83.24	86.38	

Total = Sum(44)$_{1...12}$ = 942.38 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	128.11	112.04	115.62	100.8	96.72	83.46	77.34	88.75	89.81	104.66	114.25	124.06	

Total = Sum(45)$_{1...12}$ = 1235.61 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.22	16.81	17.34	15.12	14.51	12.52	11.6	13.31	13.47	15.7	17.14	18.61	(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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

TER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	177.35	156.52	164.86	148.45	145.96	131.11	126.58	137.99	137.46	153.9	161.9	173.31	(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=	177.35	156.52	164.86	148.45	145.96	131.11	126.58	137.99	137.46	153.9	161.9	173.31	

Output from water heater (annual)$_{1...12}$: 1815.4 (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=	81.99	72.84	77.84	71.64	71.55	65.87	65.11	68.9	67.98	74.19	76.11	80.65	(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=	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	93.33	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.54	12.91	10.5	7.95	5.94	5.02	5.42	7.05	9.46	12.01	14.02	14.94	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	162.76	164.45	160.19	151.13	139.69	128.94	121.76	120.07	124.33	133.39	144.83	155.58	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	32.33	(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=	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	-74.66	(71)

Water heating gains (Table 5)

(72)m=	110.2	108.39	104.62	99.5	96.17	91.49	87.51	92.61	94.42	99.72	105.71	108.39	(72)

TER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	341.5	339.75	329.31	312.58	295.81	279.45	268.7	273.73	282.21	299.12	318.55	332.91	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	0.92	x	10.63	x	0.63	x	0.7	=	2.99	(74)
North	0.9x 0.77	x	0.92	x	20.32	x	0.63	x	0.7	=	5.71	(74)
North	0.9x 0.77	x	0.92	x	34.53	x	0.63	x	0.7	=	9.71	(74)
North	0.9x 0.77	x	0.92	x	55.46	x	0.63	x	0.7	=	15.59	(74)
North	0.9x 0.77	x	0.92	x	74.72	x	0.63	x	0.7	=	21.01	(74)
North	0.9x 0.77	x	0.92	x	79.99	x	0.63	x	0.7	=	22.49	(74)
North	0.9x 0.77	x	0.92	x	74.68	x	0.63	x	0.7	=	21	(74)
North	0.9x 0.77	x	0.92	x	59.25	x	0.63	x	0.7	=	16.66	(74)
North	0.9x 0.77	x	0.92	x	41.52	x	0.63	x	0.7	=	11.67	(74)
North	0.9x 0.77	x	0.92	x	24.19	x	0.63	x	0.7	=	6.8	(74)
North	0.9x 0.77	x	0.92	x	13.12	x	0.63	x	0.7	=	3.69	(74)
North	0.9x 0.77	x	0.92	x	8.86	x	0.63	x	0.7	=	2.49	(74)
Northeast	0.9x 0.77	x	1.7	x	11.28	x	0.63	x	0.7	=	5.86	(75)
Northeast	0.9x 0.77	x	1.7	x	22.97	x	0.63	x	0.7	=	11.93	(75)
Northeast	0.9x 0.77	x	1.7	x	41.38	x	0.63	x	0.7	=	21.5	(75)
Northeast	0.9x 0.77	x	1.7	x	67.96	x	0.63	x	0.7	=	35.31	(75)
Northeast	0.9x 0.77	x	1.7	x	91.35	x	0.63	x	0.7	=	47.46	(75)
Northeast	0.9x 0.77	x	1.7	x	97.38	x	0.63	x	0.7	=	50.6	(75)
Northeast	0.9x 0.77	x	1.7	x	91.1	x	0.63	x	0.7	=	47.33	(75)
Northeast	0.9x 0.77	x	1.7	x	72.63	x	0.63	x	0.7	=	37.73	(75)
Northeast	0.9x 0.77	x	1.7	x	50.42	x	0.63	x	0.7	=	26.2	(75)
Northeast	0.9x 0.77	x	1.7	x	28.07	x	0.63	x	0.7	=	14.58	(75)
Northeast	0.9x 0.77	x	1.7	x	14.2	x	0.63	x	0.7	=	7.38	(75)
Northeast	0.9x 0.77	x	1.7	x	9.21	x	0.63	x	0.7	=	4.79	(75)
East	0.9x 0.77	x	2.26	x	19.64	x	0.63	x	0.7	=	13.57	(76)
East	0.9x 0.77	x	2.26	x	38.42	x	0.63	x	0.7	=	26.54	(76)
East	0.9x 0.77	x	2.26	x	63.27	x	0.63	x	0.7	=	43.7	(76)
East	0.9x 0.77	x	2.26	x	92.28	x	0.63	x	0.7	=	63.74	(76)
East	0.9x 0.77	x	2.26	x	113.09	x	0.63	x	0.7	=	78.11	(76)
East	0.9x 0.77	x	2.26	x	115.77	x	0.63	x	0.7	=	79.96	(76)
East	0.9x 0.77	x	2.26	x	110.22	x	0.63	x	0.7	=	76.13	(76)
East	0.9x 0.77	x	2.26	x	94.68	x	0.63	x	0.7	=	65.39	(76)
East	0.9x 0.77	x	2.26	x	73.59	x	0.63	x	0.7	=	50.83	(76)
East	0.9x 0.77	x	2.26	x	45.59	x	0.63	x	0.7	=	31.49	(76)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	2.26	x	24.49	x	0.63	x	0.7	=	16.91	(76)
East	0.9x	0.77	x	2.26	x	16.15	x	0.63	x	0.7	=	11.16	(76)
South	0.9x	0.77	x	0.93	x	46.75	x	0.63	x	0.7	=	13.29	(78)
South	0.9x	0.77	x	0.93	x	76.57	x	0.63	x	0.7	=	21.76	(78)
South	0.9x	0.77	x	0.93	x	97.53	x	0.63	x	0.7	=	27.72	(78)
South	0.9x	0.77	x	0.93	x	110.23	x	0.63	x	0.7	=	31.33	(78)
South	0.9x	0.77	x	0.93	x	114.87	x	0.63	x	0.7	=	32.65	(78)
South	0.9x	0.77	x	0.93	x	110.55	x	0.63	x	0.7	=	31.42	(78)
South	0.9x	0.77	x	0.93	x	108.01	x	0.63	x	0.7	=	30.7	(78)
South	0.9x	0.77	x	0.93	x	104.89	x	0.63	x	0.7	=	29.81	(78)
South	0.9x	0.77	x	0.93	x	101.89	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	0.93	x	82.59	x	0.63	x	0.7	=	23.47	(78)
South	0.9x	0.77	x	0.93	x	55.42	x	0.63	x	0.7	=	15.75	(78)
South	0.9x	0.77	x	0.93	x	40.4	x	0.63	x	0.7	=	11.48	(78)
West	0.9x	0.77	x	2.99	x	19.64	x	0.63	x	0.7	=	17.95	(80)
West	0.9x	0.77	x	1.41	x	19.64	x	0.63	x	0.7	=	8.46	(80)
West	0.9x	0.77	x	2.99	x	38.42	x	0.63	x	0.7	=	35.11	(80)
West	0.9x	0.77	x	1.41	x	38.42	x	0.63	x	0.7	=	16.56	(80)
West	0.9x	0.77	x	2.99	x	63.27	x	0.63	x	0.7	=	57.82	(80)
West	0.9x	0.77	x	1.41	x	63.27	x	0.63	x	0.7	=	27.27	(80)
West	0.9x	0.77	x	2.99	x	92.28	x	0.63	x	0.7	=	84.32	(80)
West	0.9x	0.77	x	1.41	x	92.28	x	0.63	x	0.7	=	39.76	(80)
West	0.9x	0.77	x	2.99	x	113.09	x	0.63	x	0.7	=	103.34	(80)
West	0.9x	0.77	x	1.41	x	113.09	x	0.63	x	0.7	=	48.73	(80)
West	0.9x	0.77	x	2.99	x	115.77	x	0.63	x	0.7	=	105.79	(80)
West	0.9x	0.77	x	1.41	x	115.77	x	0.63	x	0.7	=	49.89	(80)
West	0.9x	0.77	x	2.99	x	110.22	x	0.63	x	0.7	=	100.72	(80)
West	0.9x	0.77	x	1.41	x	110.22	x	0.63	x	0.7	=	47.49	(80)
West	0.9x	0.77	x	2.99	x	94.68	x	0.63	x	0.7	=	86.51	(80)
West	0.9x	0.77	x	1.41	x	94.68	x	0.63	x	0.7	=	40.8	(80)
West	0.9x	0.77	x	2.99	x	73.59	x	0.63	x	0.7	=	67.24	(80)
West	0.9x	0.77	x	1.41	x	73.59	x	0.63	x	0.7	=	31.71	(80)
West	0.9x	0.77	x	2.99	x	45.59	x	0.63	x	0.7	=	41.66	(80)
West	0.9x	0.77	x	1.41	x	45.59	x	0.63	x	0.7	=	19.65	(80)
West	0.9x	0.77	x	2.99	x	24.49	x	0.63	x	0.7	=	22.38	(80)
West	0.9x	0.77	x	1.41	x	24.49	x	0.63	x	0.7	=	10.55	(80)
West	0.9x	0.77	x	2.99	x	16.15	x	0.63	x	0.7	=	14.76	(80)
West	0.9x	0.77	x	1.41	x	16.15	x	0.63	x	0.7	=	6.96	(80)
Northwest	0.9x	0.77	x	1.7	x	11.28	x	0.63	x	0.7	=	5.86	(81)
Northwest	0.9x	0.77	x	1.7	x	22.97	x	0.63	x	0.7	=	11.93	(81)
Northwest	0.9x	0.77	x	1.7	x	41.38	x	0.63	x	0.7	=	21.5	(81)

TER WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	1.7	x	67.96	x	0.63	x	0.7	=	35.31		(81)
Northwest	0.9x	0.77	x	1.7	x	91.35	x	0.63	x	0.7	=	47.46		(81)
Northwest	0.9x	0.77	x	1.7	x	97.38	x	0.63	x	0.7	=	50.6		(81)
Northwest	0.9x	0.77	x	1.7	x	91.1	x	0.63	x	0.7	=	47.33		(81)
Northwest	0.9x	0.77	x	1.7	x	72.63	x	0.63	x	0.7	=	37.73		(81)
Northwest	0.9x	0.77	x	1.7	x	50.42	x	0.63	x	0.7	=	26.2		(81)
Northwest	0.9x	0.77	x	1.7	x	28.07	x	0.63	x	0.7	=	14.58		(81)
Northwest	0.9x	0.77	x	1.7	x	14.2	x	0.63	x	0.7	=	7.38		(81)
Northwest	0.9x	0.77	x	1.7	x	9.21	x	0.63	x	0.7	=	4.79		(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	67.98	129.54	209.21	305.36	378.76	390.74	370.69	314.64	242.8	152.23	84.04	56.42	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	409.47	469.29	538.52	617.94	674.57	670.19	639.39	588.37	525.01	451.35	402.59	389.34	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.97	0.91	0.76	0.57	0.42	0.47	0.74	0.95	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.93	20.09	20.36	20.69	20.9	20.98	21	20.99	20.94	20.64	20.22	19.9	(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	20	(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	0.49	0.32	0.37	0.65	0.92	0.99	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.58	18.82	19.2	19.65	19.92	20	20.01	20.01	19.96	19.6	19.01	18.54	(90)

fLA = Living area ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.17	19.37	19.71	20.1	20.35	20.43	20.44	20.44	20.39	20.06	19.54	19.13	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.17	19.37	19.71	20.1	20.35	20.43	20.44	20.44	20.39	20.06	19.54	19.13	(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	0.73	0.52	0.37	0.42	0.69	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	406.07	461.39	515.86	544.67	489.54	349.73	233.7	244.82	361.37	417.36	395.79	386.78	(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=	926.25	899.98	819.94	689.92	531.65	355.87	234.47	246.3	385.04	581.39	767.28	923.78	(97)

TER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	387.01	294.73	226.23	104.58	31.33	0	0	0	0	122.04	267.47	399.52

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1832.92 (98)

Space heating requirement in kWh/m²/year 32.73 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.5 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	387.01	294.73	226.23	104.58	31.33	0	0	0	0	122.04	267.47	399.52	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	413.92	315.22	241.96	111.85	33.51	0	0	0	0	130.52	286.06	427.3	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1960.34 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	177.35	156.52	164.86	148.45	145.96	131.11	126.58	137.99	137.46	153.9	161.9	173.31

Efficiency of water heater 79.8 (216)

(217)m=	86.84	86.48	85.66	83.9	81.5	79.8	79.8	79.8	79.8	84.2	86.14	86.97

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	204.22	180.99	192.46	176.94	179.09	164.3	158.62	172.92	172.26	182.78	187.94	199.27

Total = Sum(219a)$_{1...12}$ = 2171.8 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1960.34
Water heating fuel used		2171.8
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		256.74 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4463.88 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

TER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	423.43	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	469.11	(264)
Space and water heating	(261) + (262) + (263) + (264) =				892.54	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	133.25	(268)
Total CO2, kg/year		sum of (265)…(271) =			1064.72	(272)

TER = 27.78 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:57

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 55.7m²

Site Reference : 43LS **Plot Reference:** FLAT 13

Address : FLAT 13, 43 London Street, Reading, RG1 4PS

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)	23.71 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.44 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	33.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	32.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	0.94 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	6.92m²
Windows facing: South	1.71m²
Windows facing: North	2.1m²
Windows facing: South	2.81m²
Windows facing: West	2.81m²
Ventilation rate:	4.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 13

Address : FLAT 13, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7	(1a) x	2.3	(2a) =	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		128.11	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.92	x	1/[1/(0.92)+ 0.04]	=	6.14			(27)
Windows Type 2			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Windows Type 5			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	36.7	16.35	20.35	x	0.16	=	3.26	14	284.9	(29)
Walls Type2	6.21	2.1	4.11	x	0.14	=	0.58	14	57.54	(29)
Walls Type3	2.85	0	2.85	x	0.14	=	0.4	9	25.65	(29)
Walls Type4	9.9	0	9.9	x	0.14	=	1.39	9	89.1	(29)
Total area of elements, m²			55.66							(31)
Party wall			26.22	x	0	=	0	20	524.4	(32)
Party floor			55.7					30	1671	(32a)
Party ceiling			55.7					20	1114	(32b)
Internal wall **			95.68					9	861.12	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.39 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4627.71 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 83.08 (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 — 8.35 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 30.73 (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=	15.3	15.11	14.93	14	13.82	12.89	12.89	12.71	13.26	13.82	14.19	14.56	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	46.03	45.85	45.66	44.74	44.55	43.63	43.63	43.44	44	44.55	44.92	45.29	

Average = Sum(39)$_{1...12}$ /12= 44.69 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.83	0.82	0.82	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.81	0.81	

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 — 1.86 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 78.32 (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=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Total = Sum(44)$_{1...12}$ = 939.88 (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = 1232.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)	0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	(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=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Output from water heater (annual)$_{1...12}$ 1397.9 (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=	42.48	37.16	38.34	33.43	32.07	27.68	25.65	29.43	29.78	34.71	37.89	41.14	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.44	12.83	10.43	7.9	5.9	4.98	5.39	7	9.4	11.93	13.92	14.84	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	161.99	163.67	159.43	150.42	139.03	128.33	121.19	119.5	123.74	132.76	144.14	154.84	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	57.1	55.29	51.53	46.43	43.11	38.44	34.47	39.56	41.36	46.65	52.62	55.3	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	292.08	290.34	279.95	263.29	246.6	230.31	219.6	224.62	233.05	249.89	269.24	283.54	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x	0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x	0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x	0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x	0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x	0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x	0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x	0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x	0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x	0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x	0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x	0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
East	0.9x	0.77	x	6.92	x	19.64	x	0.51	x	0.8	=	38.43	(76)
East	0.9x	0.77	x	6.92	x	38.42	x	0.51	x	0.8	=	75.17	(76)
East	0.9x	0.77	x	6.92	x	63.27	x	0.51	x	0.8	=	123.8	(76)
East	0.9x	0.77	x	6.92	x	92.28	x	0.51	x	0.8	=	180.55	(76)
East	0.9x	0.77	x	6.92	x	113.09	x	0.51	x	0.8	=	221.28	(76)
East	0.9x	0.77	x	6.92	x	115.77	x	0.51	x	0.8	=	226.52	(76)
East	0.9x	0.77	x	6.92	x	110.22	x	0.51	x	0.8	=	215.65	(76)
East	0.9x	0.77	x	6.92	x	94.68	x	0.51	x	0.8	=	185.24	(76)
East	0.9x	0.77	x	6.92	x	73.59	x	0.51	x	0.8	=	143.98	(76)
East	0.9x	0.77	x	6.92	x	45.59	x	0.51	x	0.8	=	89.2	(76)
East	0.9x	0.77	x	6.92	x	24.49	x	0.51	x	0.8	=	47.92	(76)
East	0.9x	0.77	x	6.92	x	16.15	x	0.51	x	0.8	=	31.6	(76)
South	0.9x	0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x	0.77	x	2.81	x	46.75	x	0.63	x	0.7	=	40.15	(78)
South	0.9x	0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x	0.77	x	2.81	x	76.57	x	0.63	x	0.7	=	65.75	(78)
South	0.9x	0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x	0.77	x	2.81	x	97.53	x	0.63	x	0.7	=	83.76	(78)
South	0.9x	0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x	0.77	x	2.81	x	110.23	x	0.63	x	0.7	=	94.67	(78)
South	0.9x	0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)
South	0.9x	0.77	x	2.81	x	114.87	x	0.63	x	0.7	=	98.65	(78)
South	0.9x	0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x	0.77	x	2.81	x	110.55	x	0.63	x	0.7	=	94.94	(78)
South	0.9x	0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x	0.77	x	2.81	x	108.01	x	0.63	x	0.7	=	92.76	(78)
South	0.9x	0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	2.81	x	104.89	x	0.63	x	0.7	=	90.08	(78)
South	0.9x	0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x	0.77	x	2.81	x	101.89	x	0.63	x	0.7	=	87.5	(78)
South	0.9x	0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x	0.77	x	2.81	x	82.59	x	0.63	x	0.7	=	70.92	(78)
South	0.9x	0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	2.81	x	55.42	x	0.63	x	0.7	=	47.59	(78)
South	0.9x	0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)
South	0.9x	0.77	x	2.81	x	40.4	x	0.63	x	0.7	=	34.69	(78)
West	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)
West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	126.7	226.98	335.03	447.67	525.03	529.98	507.44	449.47	374.57	257.96	153.92	106.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	418.78	517.32	614.98	710.97	771.63	760.29	727.03	674.08	607.62	507.85	423.15	390.5	(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=	0.91	0.86	0.77	0.64	0.49	0.36	0.26	0.29	0.47	0.71	0.87	0.92	(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=	20.59	20.59	20.59	20.6	20.6	20.61	20.61	20.61	20.61	20.6	20.6	20.59	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.91	0.85	0.76	0.62	0.48	0.34	0.24	0.27	0.44	0.69	0.86	0.92	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.59	20.59	20.59	20.6	20.6	20.61	20.61	20.61	20.61	20.6	20.6	20.59	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

DER WorkSheet: New dwelling design stage

(92)m=	20.77	20.77	20.77	20.78	20.78	20.78	20.78	20.79	20.78	20.78	20.78	20.78	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.77	20.77	20.77	20.78	20.78	20.78	20.78	20.79	20.78	20.78	20.78	20.78	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.91	0.85	0.76	0.63	0.48	0.34	0.25	0.28	0.45	0.7	0.86	0.92	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	380.64	440.67	469.36	446.97	372.88	261.6	180.27	187.29	275.08	356.3	365.1	359.79	(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=	758.27	727.76	651.8	531.44	404.53	269.81	182.55	190.5	294.01	453.54	614.45	750.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	280.96	192.92	135.74	60.82	23.54	0	0	0	0	72.34	179.53	290.89	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1236.74 (98)

Space heating requirement in kWh/m²/year 22.2 (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 1 499.01 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	280.96	192.92	135.74	60.82	23.54	0	0	0	0	72.34	179.53	290.89	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	56.3	38.66	27.2	12.19	4.72	0	0	0	0	14.5	35.98	58.29	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 247.84 (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)

	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	73.04	64.09	66.63	58.78	56.92	49.88	46.96	52.82	53.13	61	65.69	70.96	

Total = Sum(219a)$_{1...12}$ = 719.9 (219)

DER WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		247.84	
Water heating fuel used		719.9	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	142.62		(230a)
warm air heating system fans	76.87		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		219.48	(231)
Electricity for lighting		255.04	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1442.26	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519 =	128.63	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.519 =	373.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =		502.26	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	113.91	(267)
Electricity for lighting	(232) x	0.519 =	132.36	(268)
Total CO2, kg/year	sum of (265)…(271) =		748.53	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =		13.44	(273)
EI rating (section 14)			90	(274)

Predicted Energy Assessment

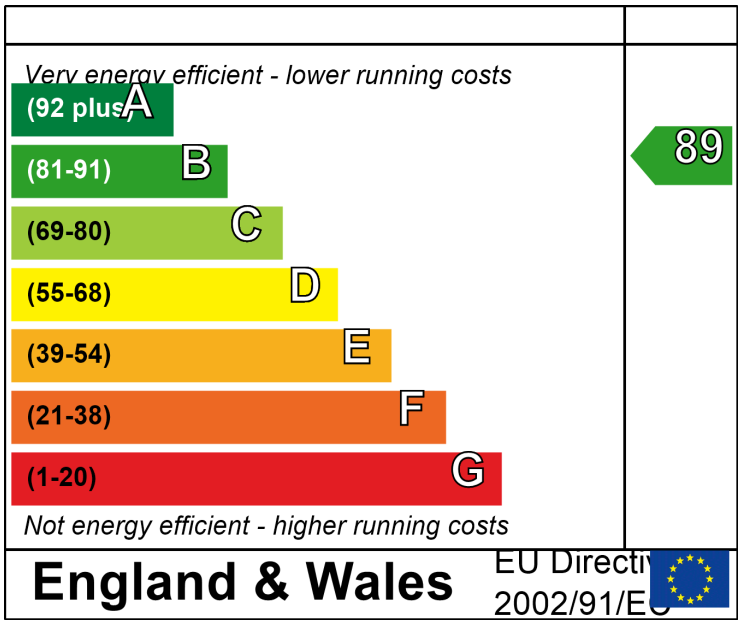
FLAT 13
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 55.7 m²

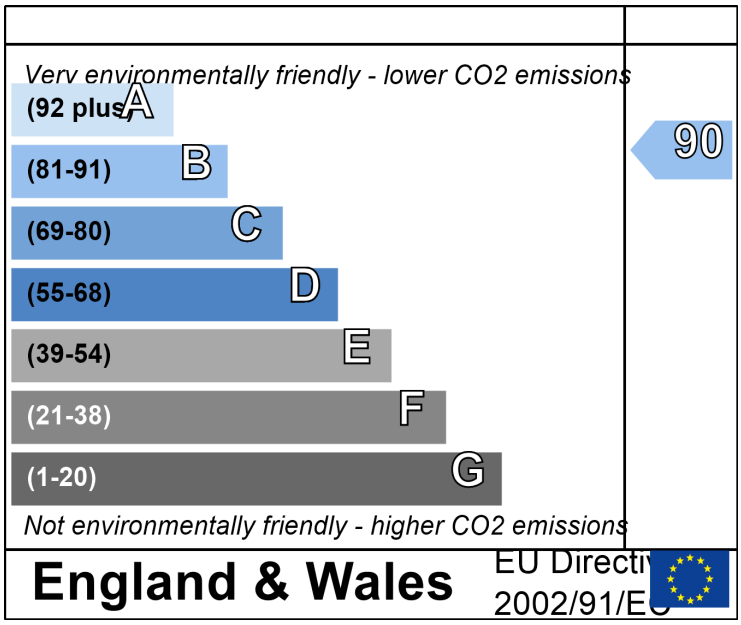
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 13

Address : FLAT 13, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7 (1a)	x	2.3 (2a)	=	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.11	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.92	x	1/[1/(0.92)+ 0.04]	=	6.14			(27)
Windows Type 2			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Windows Type 5			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	36.7	16.35	20.35	x	0.16	=	3.26	14	284.9	(29)
Walls Type2	6.21	2.1	4.11	x	0.14	=	0.58	14	57.54	(29)
Walls Type3	2.85	0	2.85	x	0.14	=	0.4	9	25.65	(29)
Walls Type4	9.9	0	9.9	x	0.14	=	1.39	9	89.1	(29)
Total area of elements, m²			55.66							(31)
Party wall			26.22	x	0	=	0	20	524.4	(32)
Party floor			55.7					30	1671	(32a)
Party ceiling			55.7					20	1114	(32b)
Internal wall **			95.68					9	861.12	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.39 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4627.71 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 83.08 (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 — 8.35 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 30.73 (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=	15.3	15.11	14.93	14	13.82	12.89	12.89	12.71	13.26	13.82	14.19	14.56	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	46.03	45.85	45.66	44.74	44.55	43.63	43.63	43.44	44	44.55	44.92	45.29	

Average = Sum(39)$_{1...12}$ /12= 44.69 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.83	0.82	0.82	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.81	0.81	

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 — 1.86 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 78.32 (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=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Total = Sum(44)$_{1...12}$ = 939.88 (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = 1232.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	(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=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Output from water heater (annual)$_{1...12}$ 1397.9 (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=	42.48	37.16	38.34	33.43	32.07	27.68	25.65	29.43	29.78	34.71	37.89	41.14	(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=	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	36.1	32.07	26.08	19.74	14.76	12.46	13.46	17.5	23.49	29.82	34.81	37.11	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	241.77	244.28	237.96	224.5	207.51	191.54	180.87	178.37	184.69	198.15	215.14	231.1	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48	48	48	48	48	48	48	48	48	48	48	48	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	57.1	55.29	51.53	46.43	43.11	38.44	34.47	39.56	41.36	46.65	52.62	55.3	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	427.82	424.49	408.42	383.52	358.23	335.29	321.66	328.27	342.39	367.47	395.41	416.36	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x 0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x 0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x 0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x 0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x 0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x 0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x 0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x 0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x 0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x 0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
East	0.9x 0.77	x	6.92	x	19.64	x	0.51	x	0.8	=	38.43	(76)
East	0.9x 0.77	x	6.92	x	38.42	x	0.51	x	0.8	=	75.17	(76)
East	0.9x 0.77	x	6.92	x	63.27	x	0.51	x	0.8	=	123.8	(76)
East	0.9x 0.77	x	6.92	x	92.28	x	0.51	x	0.8	=	180.55	(76)
East	0.9x 0.77	x	6.92	x	113.09	x	0.51	x	0.8	=	221.28	(76)
East	0.9x 0.77	x	6.92	x	115.77	x	0.51	x	0.8	=	226.52	(76)
East	0.9x 0.77	x	6.92	x	110.22	x	0.51	x	0.8	=	215.65	(76)
East	0.9x 0.77	x	6.92	x	94.68	x	0.51	x	0.8	=	185.24	(76)
East	0.9x 0.77	x	6.92	x	73.59	x	0.51	x	0.8	=	143.98	(76)
East	0.9x 0.77	x	6.92	x	45.59	x	0.51	x	0.8	=	89.2	(76)
East	0.9x 0.77	x	6.92	x	24.49	x	0.51	x	0.8	=	47.92	(76)
East	0.9x 0.77	x	6.92	x	16.15	x	0.51	x	0.8	=	31.6	(76)
South	0.9x 0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x 0.77	x	2.81	x	46.75	x	0.63	x	0.7	=	40.15	(78)
South	0.9x 0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x 0.77	x	2.81	x	76.57	x	0.63	x	0.7	=	65.75	(78)
South	0.9x 0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x 0.77	x	2.81	x	97.53	x	0.63	x	0.7	=	83.76	(78)
South	0.9x 0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x 0.77	x	2.81	x	110.23	x	0.63	x	0.7	=	94.67	(78)
South	0.9x 0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)
South	0.9x 0.77	x	2.81	x	114.87	x	0.63	x	0.7	=	98.65	(78)
South	0.9x 0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x 0.77	x	2.81	x	110.55	x	0.63	x	0.7	=	94.94	(78)
South	0.9x 0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x 0.77	x	2.81	x	108.01	x	0.63	x	0.7	=	92.76	(78)
South	0.9x 0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	2.81	x	104.89	x	0.63	x	0.7	=	90.08	(78)
South	0.9x	0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x	0.77	x	2.81	x	101.89	x	0.63	x	0.7	=	87.5	(78)
South	0.9x	0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x	0.77	x	2.81	x	82.59	x	0.63	x	0.7	=	70.92	(78)
South	0.9x	0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	2.81	x	55.42	x	0.63	x	0.7	=	47.59	(78)
South	0.9x	0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)
South	0.9x	0.77	x	2.81	x	40.4	x	0.63	x	0.7	=	34.69	(78)
West	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)
West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	126.7	226.98	335.03	447.67	525.03	529.98	507.44	449.47	374.57	257.96	153.92	106.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	554.53	651.47	743.45	831.19	883.25	865.27	829.09	777.74	716.95	625.42	549.33	523.32	(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=	0.85	0.79	0.7	0.57	0.44	0.31	0.23	0.25	0.4	0.63	0.79	0.86	(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=	20.59	20.59	20.59	20.6	20.6	20.61	20.61	20.61	20.61	20.6	20.6	20.59	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.84	0.78	0.69	0.56	0.42	0.3	0.21	0.23	0.38	0.61	0.78	0.86	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.59	20.59	20.59	20.6	20.6	20.61	20.61	20.61	20.61	20.6	20.6	20.59	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

SAP WorkSheet: New dwelling design stage

(92)m=	20.77	20.77	20.77	20.78	20.78	20.78	20.78	20.79	20.78	20.78	20.78	20.78	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.77	20.77	20.77	20.78	20.78	20.78	20.78	20.79	20.78	20.78	20.78	20.78	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.84	0.78	0.69	0.56	0.43	0.3	0.22	0.24	0.39	0.62	0.78	0.86	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	467.76	508.85	514.05	468.49	381.07	263.88	180.94	188.3	281.1	385.55	430.77	449.34	(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=	758.27	727.76	651.8	531.44	404.53	269.81	182.55	190.5	294.01	453.54	614.45	750.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	216.14	147.11	102.49	45.32	17.45	0	0	0	0	50.58	132.25	224.27	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 935.62 (98)

Space heating requirement in kWh/m²/year 16.8 (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 1 499.01 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	216.14	147.11	102.49	45.32	17.45	0	0	0	0	50.58	132.25	224.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	43.31	29.48	20.54	9.08	3.5	0	0	0	0	10.14	26.5	44.94	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 187.5 (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)

	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	73.04	64.09	66.63	58.78	56.92	49.88	46.96	52.82	53.13	61	65.69	70.96	

Total = Sum(219a)$_{1...12}$ = 719.9 (219)

SAP WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		187.5	
Water heating fuel used		719.9	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	142.62		(230a)
warm air heating system fans	76.87		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		219.48	(231)
Electricity for lighting		255.04	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1381.92	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	24.73	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	94.95	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	28.95	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a					
Energy for lighting	(232)	13.19	x 0.01 =	33.64	(250)
Additional standing charges (Table 12)				0	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost (245)...(247) + (250)…(254) =				182.27	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.76	(257)
SAP rating (Section 12)	89.39	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	97.31	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	373.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			470.94	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	113.91	(267)
Electricity for lighting	(232) x	0.519	=	132.36	(268)
Total CO2, kg/year sum of (265)…(271) =				717.22	(272)

SAP WorkSheet: New dwelling design stage

CO2 emissions per m²	(272) ÷ (4) =	12.88	(273)
EI rating (section 14)		90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	575.61	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	2210.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2785.7	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	673.82	(267)
Electricity for lighting	(232)	x	0	=	782.97	(268)
‘Total Primary Energy			sum of (265)…(271) =		4242.49	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		76.17	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 13

Address : FLAT 13, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7 (1a)	x	2.3 (2a)	=	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.11	(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) =	0.16	(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			4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.28	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33

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=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			5	x1/[1/(1.4)+ 0.04]		=	6.63			(27)
Windows Type 2			1.24	x1/[1/(1.4)+ 0.04]		=	1.64			(27)
Windows Type 3			1.52	x1/[1/(1.4)+ 0.04]		=	2.02			(27)
Windows Type 4			2.03	x1/[1/(1.4)+ 0.04]		=	2.69			(27)
Windows Type 5			2.03	x1/[1/(1.4)+ 0.04]		=	2.69			(27)
Walls Type1	36.7	11.82	24.88	x	0.18	=	4.48			(29)
Walls Type2	6.21	2.1	4.11	x	0.18	=	0.74			(29)
Walls Type3	2.85	0	2.85	x	0.18	=	0.51			(29)
Walls Type4	9.9	0	9.9	x	0.18	=	1.78			(29)
Total area of elements, m²			55.66							(31)
Party wall			26.22	x	0	=	0			(32)
Party floor			55.7							(32a)
Party ceiling			55.7							(32b)
Internal wall **			95.68							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 25.28 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4691.13 (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 | 2.78 | (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = | 28.07 | (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	23.92	23.81	23.7	23.21	23.11	22.68	22.68	22.6	22.85	23.11	23.3	23.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	51.98	51.87	51.77	51.27	51.18	50.75	50.75	50.67	50.91	51.18	51.37	51.56	

Average = Sum(39)$_{1...12}$ /12= | 51.27 | (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.93	0.93	0.93	0.92	0.92	0.91	0.91	0.91	0.91	0.92	0.92	0.93	

Average = Sum(40)$_{1...12}$ /12= | 0.92 | (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 | 1.86 | (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 | 78.32 | (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=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Total = Sum(44)$_{1...12}$ = | 939.88 | (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = | 1232.34 | (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(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): | 1.55 | (48)

Temperature factor from Table 2b | 0.54 | (49)

Energy lost from water storage, kWh/year (48) x (49) = | 0.84 | (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)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98	

Output from water heater (annual)$_{1...12}$ 1812.13 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	81.88	72.74	77.74	71.55	71.47	65.8	65.04	68.82	67.91	74.1	76.01	80.54	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.47	12.85	10.45	7.91	5.92	4.99	5.4	7.01	9.41	11.95	13.95	14.87	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	161.99	163.67	159.43	150.42	139.03	128.33	121.19	119.5	123.74	132.76	144.14	154.84	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	110.05	108.24	104.48	99.38	96.06	91.39	87.42	92.51	94.31	99.6	105.57	108.25	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	340.38	338.63	328.24	311.57	294.87	278.58	267.87	272.89	281.34	298.18	317.53	331.83	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.52	x	10.63	x	0.63	x	0.7	=	4.94	(74)
North	0.9x	0.77	x	1.52	x	20.32	x	0.63	x	0.7	=	9.44	(74)
North	0.9x	0.77	x	1.52	x	34.53	x	0.63	x	0.7	=	16.04	(74)
North	0.9x	0.77	x	1.52	x	55.46	x	0.63	x	0.7	=	25.76	(74)
North	0.9x	0.77	x	1.52	x	74.72	x	0.63	x	0.7	=	34.71	(74)
North	0.9x	0.77	x	1.52	x	79.99	x	0.63	x	0.7	=	37.16	(74)
North	0.9x	0.77	x	1.52	x	74.68	x	0.63	x	0.7	=	34.69	(74)
North	0.9x	0.77	x	1.52	x	59.25	x	0.63	x	0.7	=	27.52	(74)
North	0.9x	0.77	x	1.52	x	41.52	x	0.63	x	0.7	=	19.29	(74)
North	0.9x	0.77	x	1.52	x	24.19	x	0.63	x	0.7	=	11.24	(74)
North	0.9x	0.77	x	1.52	x	13.12	x	0.63	x	0.7	=	6.09	(74)
North	0.9x	0.77	x	1.52	x	8.86	x	0.63	x	0.7	=	4.12	(74)
East	0.9x	0.77	x	5	x	19.64	x	0.63	x	0.7	=	30.01	(76)
East	0.9x	0.77	x	5	x	38.42	x	0.63	x	0.7	=	58.71	(76)
East	0.9x	0.77	x	5	x	63.27	x	0.63	x	0.7	=	96.69	(76)
East	0.9x	0.77	x	5	x	92.28	x	0.63	x	0.7	=	141.01	(76)
East	0.9x	0.77	x	5	x	113.09	x	0.63	x	0.7	=	172.81	(76)
East	0.9x	0.77	x	5	x	115.77	x	0.63	x	0.7	=	176.9	(76)
East	0.9x	0.77	x	5	x	110.22	x	0.63	x	0.7	=	168.42	(76)
East	0.9x	0.77	x	5	x	94.68	x	0.63	x	0.7	=	144.67	(76)
East	0.9x	0.77	x	5	x	73.59	x	0.63	x	0.7	=	112.45	(76)
East	0.9x	0.77	x	5	x	45.59	x	0.63	x	0.7	=	69.66	(76)
East	0.9x	0.77	x	5	x	24.49	x	0.63	x	0.7	=	37.42	(76)
East	0.9x	0.77	x	5	x	16.15	x	0.63	x	0.7	=	24.68	(76)
South	0.9x	0.77	x	1.24	x	46.75	x	0.63	x	0.7	=	17.72	(78)
South	0.9x	0.77	x	2.03	x	46.75	x	0.63	x	0.7	=	29	(78)
South	0.9x	0.77	x	1.24	x	76.57	x	0.63	x	0.7	=	29.02	(78)
South	0.9x	0.77	x	2.03	x	76.57	x	0.63	x	0.7	=	47.5	(78)
South	0.9x	0.77	x	1.24	x	97.53	x	0.63	x	0.7	=	36.96	(78)
South	0.9x	0.77	x	2.03	x	97.53	x	0.63	x	0.7	=	60.51	(78)
South	0.9x	0.77	x	1.24	x	110.23	x	0.63	x	0.7	=	41.77	(78)
South	0.9x	0.77	x	2.03	x	110.23	x	0.63	x	0.7	=	68.39	(78)
South	0.9x	0.77	x	1.24	x	114.87	x	0.63	x	0.7	=	43.53	(78)
South	0.9x	0.77	x	2.03	x	114.87	x	0.63	x	0.7	=	71.27	(78)
South	0.9x	0.77	x	1.24	x	110.55	x	0.63	x	0.7	=	41.89	(78)
South	0.9x	0.77	x	2.03	x	110.55	x	0.63	x	0.7	=	68.58	(78)
South	0.9x	0.77	x	1.24	x	108.01	x	0.63	x	0.7	=	40.93	(78)
South	0.9x	0.77	x	2.03	x	108.01	x	0.63	x	0.7	=	67.01	(78)
South	0.9x	0.77	x	1.24	x	104.89	x	0.63	x	0.7	=	39.75	(78)

TER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	2.03	x	104.89	x	0.63	x	0.7	=	65.08	(78)
South	0.9x	0.77	x	1.24	x	101.89	x	0.63	x	0.7	=	38.61	(78)
South	0.9x	0.77	x	2.03	x	101.89	x	0.63	x	0.7	=	63.21	(78)
South	0.9x	0.77	x	1.24	x	82.59	x	0.63	x	0.7	=	31.3	(78)
South	0.9x	0.77	x	2.03	x	82.59	x	0.63	x	0.7	=	51.24	(78)
South	0.9x	0.77	x	1.24	x	55.42	x	0.63	x	0.7	=	21	(78)
South	0.9x	0.77	x	2.03	x	55.42	x	0.63	x	0.7	=	34.38	(78)
South	0.9x	0.77	x	1.24	x	40.4	x	0.63	x	0.7	=	15.31	(78)
South	0.9x	0.77	x	2.03	x	40.4	x	0.63	x	0.7	=	25.06	(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=	93.86	168.5	249.45	334.19	392.48	396.36	379.43	335.76	279.21	191.72	114.09	79.19	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	434.23	507.13	577.69	645.76	687.35	674.94	647.3	608.65	560.54	489.89	431.62	411.02	(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	0.98	0.94	0.84	0.67	0.48	0.34	0.38	0.61	0.89	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.23	20.41	20.64	20.86	20.97	21	21	21	20.99	20.83	20.49	20.2	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.14	20.14	20.14	20.15	20.15	20.16	20.16	20.16	20.16	20.15	20.15	20.15	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.97	0.93	0.81	0.61	0.42	0.28	0.31	0.54	0.86	0.97	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.13	19.38	19.7	20	20.13	20.16	20.16	20.16	20.15	19.97	19.5	19.08	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

TER WorkSheet: New dwelling design stage

(92)m=	19.62	19.84	20.12	20.39	20.5	20.53	20.54	20.54	20.52	20.36	19.95	19.58	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.62	19.84	20.12	20.39	20.5	20.53	20.54	20.54	20.52	20.36	19.95	19.58	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.97	0.93	0.82	0.64	0.44	0.31	0.34	0.57	0.87	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	428.84	492.43	535.54	526.61	437.82	299.86	199.62	209.36	321.71	424.28	419.4	407.14	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	796.52	774.94	705.25	589.07	450.59	301.09	199.72	209.56	327.01	499.44	659.86	793.04	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	273.55	189.84	126.26	44.97	9.5	0	0	0	0	55.92	173.13	287.1	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1160.28 (98)

Space heating requirement in kWh/m²/year 20.83 (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)													
	273.55	189.84	126.26	44.97	9.5	0	0	0	0	55.92	173.13	287.1	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	292.57	203.04	135.04	48.09	10.16	0	0	0	0	59.8	185.16	307.06	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1240.94 (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)

	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98	

Efficiency of water heater 79.8 (216)

(217)m=	85.97	85.33	84.12	82.06	80.38	79.8	79.8	79.8	79.8	82.4	85	86.16	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	205.89	183.07	195.62	180.58	181.27	164.03	158.37	172.63	171.96	186.44	190.12	200.77	

Total = Sum(219a)$_{1...12}$ = 2190.75 (219)

TER WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		1240.94	
Water heating fuel used		2190.75	
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		255.56	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3762.25	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	268.04	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	473.2	(264)
Space and water heating	(261) + (262) + (263) + (264) =				741.25	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	132.64	(268)
Total CO2, kg/year	sum of (265)…(271) =				912.81	(272)

TER = 23.71 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:55

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 59.5m²

Site Reference : 43LS **Plot Reference:** FLAT 14

Address : FLAT 14, 43 London Street, Reading, RG1 4PS

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)	24.95 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.05 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	**OK**
Openings	0.96 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	5.54m²
Windows facing: South	1.73m²
Windows facing: West	2.87m²
Windows facing: North West	2.12m²
Windows facing: North East	2.1m²
Windows facing: North	1.71m²
Windows facing: East	2.81m²
Ventilation rate:	4.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Roofs U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 14

Address : FLAT 14, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	59.5 (1a)	x	2.3 (2a)	=	136.85	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	59.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	136.85	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(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) =	0.19	(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

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37	(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=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			5.54	x	1/[1/(0.92)+ 0.04]	=	4.92			(27)
Windows Type 2			1.73	x	1/[1/(0.92)+ 0.04]	=	1.54			(27)
Windows Type 3			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 4			2.12	x	1/[1/(1.1)+ 0.04]	=	2.23			(27)
Windows Type 5			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 6			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 7			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	62.56	18.88	43.68	x	0.16	=	6.99	14	611.52	(29)
Walls Type2	9.43	2.1	7.33	x	0.14	=	1.03	14	102.62	(29)
Roof	1.2	0	1.2	x	0.12	=	0.14	9	10.8	(30)
Total area of elements, m²			73.19							(31)
Party wall			11.73	x	0	=	0	20	234.6	(32)
Party floor			59.5					30	1785	(32a)
Party ceiling			58.3					20	1166	(32b)
Internal wall **			112.7					9	1014.3	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 27.54 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4924.84 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 82.77 (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 — 10.98 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = — 38.51 (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=	17.42	17.2	16.98	15.89	15.67	14.58	14.58	14.36	15.02	15.67	16.11	16.55	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	55.94	55.72	55.5	54.41	54.19	53.09	53.09	52.87	53.53	54.19	54.62	55.06	

Average = Sum(39)$_{1...12}$ /12= 54.35 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.94	0.94	0.93	0.91	0.91	0.89	0.89	0.89	0.9	0.91	0.92	0.93	

Average = Sum(40)$_{1...12}$ /12= 0.91 (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 — 1.97 (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 — 80.93 (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=	89.02	85.78	82.55	79.31	76.07	72.83	72.83	76.07	79.31	82.55	85.78	89.02	

Total = Sum(44)$_{1...12}$ = 971.13 (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=	132.01	115.46	119.14	103.87	99.67	86.01	79.7	91.45	92.55	107.85	117.73	127.85	

Total = Sum(45)$_{1...12}$ = 1273.3 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.8	17.32	17.87	15.58	14.95	12.9	11.95	13.72	13.88	16.18	17.66	19.18	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	146.08	128.16	133.21	117.48	113.73	99.61	93.76	105.52	106.15	121.92	131.34	141.91	(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=	146.08	128.16	133.21	117.48	113.73	99.61	93.76	105.52	106.15	121.92	131.34	141.91	

Output from water heater (annual)$_{1...12}$ 1438.86 (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=	43.89	38.39	39.62	34.54	33.14	28.6	26.5	30.41	30.77	35.86	39.15	42.51	(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=	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.31	13.59	11.06	8.37	6.26	5.28	5.71	7.42	9.96	12.64	14.76	15.73	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	171.68	173.47	168.98	159.42	147.35	136.02	128.44	126.66	131.15	140.71	152.77	164.11	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	(71)

Water heating gains (Table 5)

(72)m=	59	57.13	53.25	47.97	44.54	39.72	35.62	40.87	42.74	48.2	54.37	57.14	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	306.71	304.91	294	276.48	258.88	241.74	230.49	235.67	244.57	262.27	282.62	297.7	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x	0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x	0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x	0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x	0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x	0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x	0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x	0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x	0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x	0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x	0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x	0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
Northeast	0.9x	0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(75)
Northeast	0.9x	0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(75)
Northeast	0.9x	0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(75)
Northeast	0.9x	0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(75)
Northeast	0.9x	0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(75)
Northeast	0.9x	0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(75)
Northeast	0.9x	0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(75)
Northeast	0.9x	0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(75)
Northeast	0.9x	0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(75)
Northeast	0.9x	0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(75)
Northeast	0.9x	0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(75)
Northeast	0.9x	0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(75)
East	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(76)
East	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(76)
East	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(76)
East	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(76)
East	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(76)
East	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(76)
East	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(76)
East	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(76)
East	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(76)
East	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(76)
East	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(76)
East	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(76)
South	0.9x	0.77	x	1.73	x	46.75	x	0.51	x	0.8	=	22.87	(78)
South	0.9x	0.77	x	1.73	x	76.57	x	0.51	x	0.8	=	37.45	(78)
South	0.9x	0.77	x	1.73	x	97.53	x	0.51	x	0.8	=	47.71	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.73	x	110.23	x	0.51	x	0.8	=	53.92	(78)
South	0.9x	0.77	x	1.73	x	114.87	x	0.51	x	0.8	=	56.19	(78)
South	0.9x	0.77	x	1.73	x	110.55	x	0.51	x	0.8	=	54.07	(78)
South	0.9x	0.77	x	1.73	x	108.01	x	0.51	x	0.8	=	52.83	(78)
South	0.9x	0.77	x	1.73	x	104.89	x	0.51	x	0.8	=	51.31	(78)
South	0.9x	0.77	x	1.73	x	101.89	x	0.51	x	0.8	=	49.84	(78)
South	0.9x	0.77	x	1.73	x	82.59	x	0.51	x	0.8	=	40.4	(78)
South	0.9x	0.77	x	1.73	x	55.42	x	0.51	x	0.8	=	27.11	(78)
South	0.9x	0.77	x	1.73	x	40.4	x	0.51	x	0.8	=	19.76	(78)
West	0.9x	0.77	x	5.54	x	19.64	x	0.51	x	0.8	=	30.76	(80)
West	0.9x	0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(80)
West	0.9x	0.77	x	5.54	x	38.42	x	0.51	x	0.8	=	60.18	(80)
West	0.9x	0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(80)
West	0.9x	0.77	x	5.54	x	63.27	x	0.51	x	0.8	=	99.11	(80)
West	0.9x	0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(80)
West	0.9x	0.77	x	5.54	x	92.28	x	0.51	x	0.8	=	144.55	(80)
West	0.9x	0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(80)
West	0.9x	0.77	x	5.54	x	113.09	x	0.51	x	0.8	=	177.15	(80)
West	0.9x	0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(80)
West	0.9x	0.77	x	5.54	x	115.77	x	0.51	x	0.8	=	181.34	(80)
West	0.9x	0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(80)
West	0.9x	0.77	x	5.54	x	110.22	x	0.51	x	0.8	=	172.65	(80)
West	0.9x	0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(80)
West	0.9x	0.77	x	5.54	x	94.68	x	0.51	x	0.8	=	148.3	(80)
West	0.9x	0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(80)
West	0.9x	0.77	x	5.54	x	73.59	x	0.51	x	0.8	=	115.27	(80)
West	0.9x	0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(80)
West	0.9x	0.77	x	5.54	x	45.59	x	0.51	x	0.8	=	71.41	(80)
West	0.9x	0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(80)
West	0.9x	0.77	x	5.54	x	24.49	x	0.51	x	0.8	=	38.36	(80)
West	0.9x	0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(80)
West	0.9x	0.77	x	5.54	x	16.15	x	0.51	x	0.8	=	25.3	(80)
West	0.9x	0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(80)
Northwest	0.9x	0.77	x	2.12	x	11.28	x	0.63	x	0.7	=	7.31	(81)
Northwest	0.9x	0.77	x	2.12	x	22.97	x	0.63	x	0.7	=	14.88	(81)
Northwest	0.9x	0.77	x	2.12	x	41.38	x	0.63	x	0.7	=	26.81	(81)
Northwest	0.9x	0.77	x	2.12	x	67.96	x	0.63	x	0.7	=	44.03	(81)
Northwest	0.9x	0.77	x	2.12	x	91.35	x	0.63	x	0.7	=	59.18	(81)
Northwest	0.9x	0.77	x	2.12	x	97.38	x	0.63	x	0.7	=	63.1	(81)
Northwest	0.9x	0.77	x	2.12	x	91.1	x	0.63	x	0.7	=	59.02	(81)
Northwest	0.9x	0.77	x	2.12	x	72.63	x	0.63	x	0.7	=	47.05	(81)

DER WorkSheet: New dwelling design stage

Northwest 0.9x	0.77	x	2.12	x	50.42	x	0.63	x	0.7	=	32.67	(81)
Northwest 0.9x	0.77	x	2.12	x	28.07	x	0.63	x	0.7	=	18.18	(81)
Northwest 0.9x	0.77	x	2.12	x	14.2	x	0.63	x	0.7	=	9.2	(81)
Northwest 0.9x	0.77	x	2.12	x	9.21	x	0.63	x	0.7	=	5.97	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	107.83	204.57	328.07	475.28	586.51	603.78	573.32	488.58	379.57	239.78	133.14	89.61	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	414.55	509.48	622.07	751.76	845.38	845.52	803.81	724.26	624.14	502.06	415.76	387.31	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.93	0.89	0.81	0.68	0.53	0.38	0.28	0.32	0.52	0.77	0.9	0.94	(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=	20.53	20.53	20.53	20.54	20.54	20.55	20.55	20.56	20.55	20.54	20.54	20.54	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.93	0.88	0.8	0.66	0.51	0.36	0.26	0.3	0.5	0.75	0.89	0.94	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.53	20.53	20.53	20.54	20.54	20.55	20.55	20.56	20.55	20.54	20.54	20.54	(90)

fLA = Living area ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.74	20.74	20.74	20.74	20.74	20.75	20.75	20.75	20.75	20.74	20.74	20.74	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.74	20.74	20.74	20.74	20.74	20.75	20.75	20.75	20.75	20.74	20.74	20.74	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.93	0.89	0.81	0.67	0.51	0.37	0.27	0.31	0.51	0.76	0.89	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	384.89	450.94	501.17	503.48	434.96	310.91	215.49	223	317.56	381.85	371.9	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=	919.33	882.37	790.16	644.3	490.04	326.46	220.27	229.99	355.8	549.65	745.15	910.69	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	397.63	289.92	215.01	101.39	40.98	0	0	0	0	124.84	268.75	407.27	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1845.77 (98)

Space heating requirement in kWh/m²/year 31.02 (99)

DER WorkSheet: New dwelling design stage

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		506.15 (206)
Efficiency of secondary/supplementary heating system, %		100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	397.63	289.92	215.01	101.39	40.98	0	0	0	0	124.84	268.75	407.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	78.56	57.28	42.48	20.03	8.1	0	0	0	0	24.66	53.1	80.46	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 364.67 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
146.08	128.16	133.21	117.48	113.73	99.61	93.76	105.52	106.15	121.92	131.34	141.91

Efficiency of water heater 194.18 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	75.23	66	68.6	60.5	58.57	51.3	48.28	54.34	54.67	62.78	67.64	73.08

Total = Sum(219a)$_{1...12}$ = 741 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		364.67
Water heating fuel used		741
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	152.35	(230a)
warm air heating system fans	82.11	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		234.46 (231)
Electricity for lighting		270.3 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1610.43 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.519	=	189.26	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	384.58	(264)

DER WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			573.84	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	121.68	(267)
Electricity for lighting	(232) x	0.519	=	140.29	(268)
Total CO2, kg/year	sum of (265)…(271) =			835.81	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			14.05	(273)
EI rating (section 14)				89	(274)

Predicted Energy Assessment

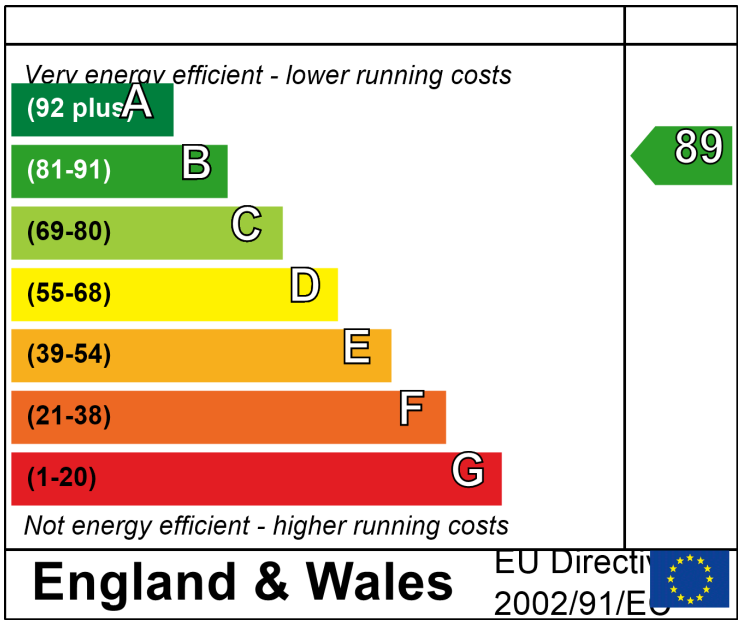
FLAT 14
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 59.5 m²

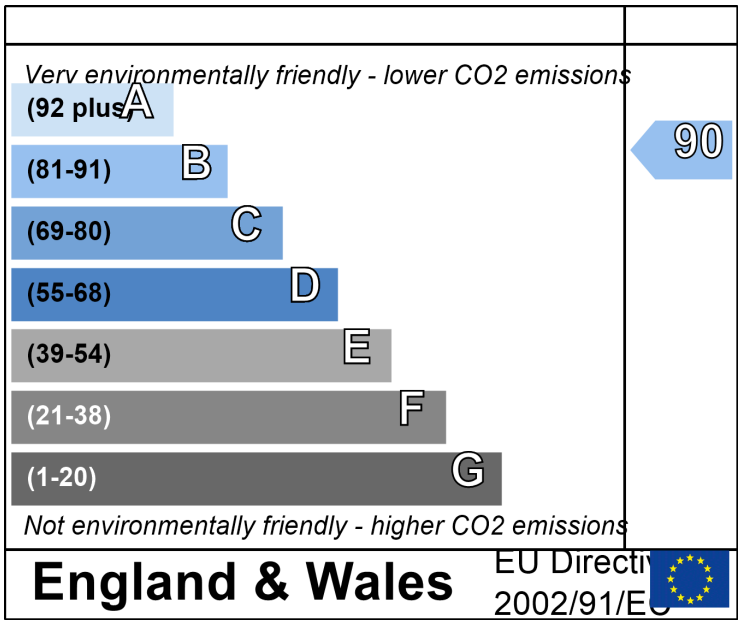
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 14

Address : FLAT 14, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	59.5 (1a)	x	2.3 (2a)	=	136.85	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	59.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	136.85	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(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) =	0.19	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37	(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=	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			5.54	x	1/[1/(0.92)+ 0.04]	=	4.92			(27)
Windows Type 2			1.73	x	1/[1/(0.92)+ 0.04]	=	1.54			(27)
Windows Type 3			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 4			2.12	x	1/[1/(1.1)+ 0.04]	=	2.23			(27)
Windows Type 5			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 6			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 7			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	62.56	18.88	43.68	x	0.16	=	6.99	14	611.52	(29)
Walls Type2	9.43	2.1	7.33	x	0.14	=	1.03	14	102.62	(29)
Roof	1.2	0	1.2	x	0.12	=	0.14	9	10.8	(30)
Total area of elements, m²			73.19							(31)
Party wall			11.73	x	0	=	0	20	234.6	(32)
Party floor			59.5					30	1785	(32a)
Party ceiling			58.3					20	1166	(32b)
Internal wall **			112.7					9	1014.3	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 27.54 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4924.84 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 82.77 (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 — 10.98 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 38.51 (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=	17.42	17.2	16.98	15.89	15.67	14.58	14.58	14.36	15.02	15.67	16.11	16.55	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	55.94	55.72	55.5	54.41	54.19	53.09	53.09	52.87	53.53	54.19	54.62	55.06	

Average = Sum(39)$_{1...12}$ /12= 54.35 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.94	0.94	0.93	0.91	0.91	0.89	0.89	0.89	0.9	0.91	0.92	0.93	

Average = Sum(40)$_{1...12}$ /12= 0.91 (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 — 1.97 (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 — 80.93 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	89.02	85.78	82.55	79.31	76.07	72.83	72.83	76.07	79.31	82.55	85.78	89.02	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 971.13 (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=	132.01	115.46	119.14	103.87	99.67	86.01	79.7	91.45	92.55	107.85	117.73	127.85	

Total = Sum(45)$_{1...12}$ = 1273.3 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.8	17.32	17.87	15.58	14.95	12.9	11.95	13.72	13.88	16.18	17.66	19.18	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	146.08	128.16	133.21	117.48	113.73	99.61	93.76	105.52	106.15	121.92	131.34	141.91	(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=	146.08	128.16	133.21	117.48	113.73	99.61	93.76	105.52	106.15	121.92	131.34	141.91	

Output from water heater (annual)$_{1...12}$ 1438.86 (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=	43.89	38.39	39.62	34.54	33.14	28.6	26.5	30.41	30.77	35.86	39.15	42.51	(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=	118.05	118.05	118.05	118.05	118.05	118.05	118.05	118.05	118.05	118.05	118.05	118.05	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	38.26	33.99	27.64	20.92	15.64	13.21	14.27	18.55	24.89	31.61	36.89	39.33	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	256.25	258.9	252.2	237.94	219.93	203.01	191.7	189.04	195.74	210.01	228.01	244.94	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48.77	48.77	48.77	48.77	48.77	48.77	48.77	48.77	48.77	48.77	48.77	48.77	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	(71)

Water heating gains (Table 5)

(72)m=	59	57.13	53.25	47.97	44.54	39.72	35.62	40.87	42.74	48.2	54.37	57.14	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	449.84	446.35	429.42	403.17	376.45	352.26	337.92	344.79	359.71	386.15	415.61	437.74	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
Northeast	0.9x 0.77	x	2.1	x	11.28	x	0.63	x	0.7	=	7.24	(75)
Northeast	0.9x 0.77	x	2.1	x	22.97	x	0.63	x	0.7	=	14.74	(75)
Northeast	0.9x 0.77	x	2.1	x	41.38	x	0.63	x	0.7	=	26.56	(75)
Northeast	0.9x 0.77	x	2.1	x	67.96	x	0.63	x	0.7	=	43.61	(75)
Northeast	0.9x 0.77	x	2.1	x	91.35	x	0.63	x	0.7	=	58.62	(75)
Northeast	0.9x 0.77	x	2.1	x	97.38	x	0.63	x	0.7	=	62.5	(75)
Northeast	0.9x 0.77	x	2.1	x	91.1	x	0.63	x	0.7	=	58.47	(75)
Northeast	0.9x 0.77	x	2.1	x	72.63	x	0.63	x	0.7	=	46.61	(75)
Northeast	0.9x 0.77	x	2.1	x	50.42	x	0.63	x	0.7	=	32.36	(75)
Northeast	0.9x 0.77	x	2.1	x	28.07	x	0.63	x	0.7	=	18.01	(75)
Northeast	0.9x 0.77	x	2.1	x	14.2	x	0.63	x	0.7	=	9.11	(75)
Northeast	0.9x 0.77	x	2.1	x	9.21	x	0.63	x	0.7	=	5.91	(75)
East	0.9x 0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(76)
East	0.9x 0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(76)
East	0.9x 0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(76)
East	0.9x 0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(76)
East	0.9x 0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(76)
East	0.9x 0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(76)
East	0.9x 0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(76)
East	0.9x 0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(76)
East	0.9x 0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(76)
East	0.9x 0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(76)
East	0.9x 0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(76)
East	0.9x 0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(76)
South	0.9x 0.77	x	1.73	x	46.75	x	0.51	x	0.8	=	22.87	(78)
South	0.9x 0.77	x	1.73	x	76.57	x	0.51	x	0.8	=	37.45	(78)
South	0.9x 0.77	x	1.73	x	97.53	x	0.51	x	0.8	=	47.71	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.73	x	110.23	x	0.51	x	0.8	=	53.92	(78)
South	0.9x	0.77	x	1.73	x	114.87	x	0.51	x	0.8	=	56.19	(78)
South	0.9x	0.77	x	1.73	x	110.55	x	0.51	x	0.8	=	54.07	(78)
South	0.9x	0.77	x	1.73	x	108.01	x	0.51	x	0.8	=	52.83	(78)
South	0.9x	0.77	x	1.73	x	104.89	x	0.51	x	0.8	=	51.31	(78)
South	0.9x	0.77	x	1.73	x	101.89	x	0.51	x	0.8	=	49.84	(78)
South	0.9x	0.77	x	1.73	x	82.59	x	0.51	x	0.8	=	40.4	(78)
South	0.9x	0.77	x	1.73	x	55.42	x	0.51	x	0.8	=	27.11	(78)
South	0.9x	0.77	x	1.73	x	40.4	x	0.51	x	0.8	=	19.76	(78)
West	0.9x	0.77	x	5.54	x	19.64	x	0.51	x	0.8	=	30.76	(80)
West	0.9x	0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(80)
West	0.9x	0.77	x	5.54	x	38.42	x	0.51	x	0.8	=	60.18	(80)
West	0.9x	0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(80)
West	0.9x	0.77	x	5.54	x	63.27	x	0.51	x	0.8	=	99.11	(80)
West	0.9x	0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(80)
West	0.9x	0.77	x	5.54	x	92.28	x	0.51	x	0.8	=	144.55	(80)
West	0.9x	0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(80)
West	0.9x	0.77	x	5.54	x	113.09	x	0.51	x	0.8	=	177.15	(80)
West	0.9x	0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(80)
West	0.9x	0.77	x	5.54	x	115.77	x	0.51	x	0.8	=	181.34	(80)
West	0.9x	0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(80)
West	0.9x	0.77	x	5.54	x	110.22	x	0.51	x	0.8	=	172.65	(80)
West	0.9x	0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(80)
West	0.9x	0.77	x	5.54	x	94.68	x	0.51	x	0.8	=	148.3	(80)
West	0.9x	0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(80)
West	0.9x	0.77	x	5.54	x	73.59	x	0.51	x	0.8	=	115.27	(80)
West	0.9x	0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(80)
West	0.9x	0.77	x	5.54	x	45.59	x	0.51	x	0.8	=	71.41	(80)
West	0.9x	0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(80)
West	0.9x	0.77	x	5.54	x	24.49	x	0.51	x	0.8	=	38.36	(80)
West	0.9x	0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(80)
West	0.9x	0.77	x	5.54	x	16.15	x	0.51	x	0.8	=	25.3	(80)
West	0.9x	0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(80)
Northwest	0.9x	0.77	x	2.12	x	11.28	x	0.63	x	0.7	=	7.31	(81)
Northwest	0.9x	0.77	x	2.12	x	22.97	x	0.63	x	0.7	=	14.88	(81)
Northwest	0.9x	0.77	x	2.12	x	41.38	x	0.63	x	0.7	=	26.81	(81)
Northwest	0.9x	0.77	x	2.12	x	67.96	x	0.63	x	0.7	=	44.03	(81)
Northwest	0.9x	0.77	x	2.12	x	91.35	x	0.63	x	0.7	=	59.18	(81)
Northwest	0.9x	0.77	x	2.12	x	97.38	x	0.63	x	0.7	=	63.1	(81)
Northwest	0.9x	0.77	x	2.12	x	91.1	x	0.63	x	0.7	=	59.02	(81)
Northwest	0.9x	0.77	x	2.12	x	72.63	x	0.63	x	0.7	=	47.05	(81)

SAP WorkSheet: New dwelling design stage

Northwest	0.9x	0.77	x	2.12	x	50.42	x	0.63	x	0.7	=	32.67	(81)
Northwest	0.9x	0.77	x	2.12	x	28.07	x	0.63	x	0.7	=	18.18	(81)
Northwest	0.9x	0.77	x	2.12	x	14.2	x	0.63	x	0.7	=	9.2	(81)
Northwest	0.9x	0.77	x	2.12	x	9.21	x	0.63	x	0.7	=	5.97	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	107.83	204.57	328.07	475.28	586.51	603.78	573.32	488.58	379.57	239.78	133.14	89.61	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	557.67	650.92	757.49	878.45	962.96	956.04	911.24	833.38	739.28	625.93	548.75	527.35	(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=	0.88	0.83	0.75	0.62	0.47	0.34	0.25	0.28	0.46	0.69	0.83	0.89	(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=	20.53	20.53	20.53	20.54	20.54	20.55	20.55	20.56	20.55	20.54	20.54	20.54	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.87	0.82	0.74	0.6	0.46	0.32	0.23	0.26	0.43	0.67	0.82	0.88	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.53	20.53	20.53	20.54	20.54	20.55	20.55	20.56	20.55	20.54	20.54	20.54	(90)

fLA = Living area ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.74	20.74	20.74	20.74	20.74	20.75	20.75	20.75	20.75	20.74	20.74	20.74	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.74	20.74	20.74	20.74	20.74	20.75	20.75	20.75	20.75	20.74	20.74	20.74	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.87	0.82	0.74	0.61	0.46	0.33	0.24	0.27	0.44	0.68	0.83	0.89	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	487.31	536.54	561.04	534.14	447.19	314.65	216.73	224.96	328.42	425.39	454.01	467.18	(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=	919.33	882.37	790.16	644.3	490.04	326.46	220.27	229.99	355.8	549.65	745.15	910.69	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	321.43	232.4	170.47	79.31	31.88	0	0	0	0	92.45	209.62	329.97	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1467.51 (98)

Space heating requirement in kWh/m²/year 24.66 (99)

SAP WorkSheet: New dwelling design stage

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		506.15 (206)
Efficiency of secondary/supplementary heating system, %		100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	321.43	232.4	170.47	79.31	31.88	0	0	0	0	92.45	209.62	329.97	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	63.5	45.91	33.68	15.67	6.3	0	0	0	0	18.26	41.41	65.19	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 289.94 (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)

	146.08	128.16	133.21	117.48	113.73	99.61	93.76	105.52	106.15	121.92	131.34	141.91	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	75.23	66	68.6	60.5	58.57	51.3	48.28	54.34	54.67	62.78	67.64	73.08	

Total = Sum(219a)$_{1...12}$ = 741 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		289.94
Water heating fuel used		741
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	152.35	(230a)
warm air heating system fans	82.11	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		234.46 (231)
Electricity for lighting		270.3 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1535.69 (338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year
Space heating - main system 1	(211) x	13.19 x 0.01 =	38.24 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	13.19	x 0.01 =	97.74	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	30.93	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a					
Energy for lighting	(232)	13.19	x 0.01 =	35.65	(250)
Additional standing charges (Table 12)				0	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			202.56	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.81	(257)
SAP rating (Section 12)		88.64	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

		Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	150.48	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	384.58	(264)
Space and water heating	(261) + (262) + (263) + (264) =				535.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	121.68	(267)
Electricity for lighting	(232) x		0.519	=	140.29	(268)
Total CO2, kg/year	sum of (265)…(271) =				797.03	(272)
CO2 emissions per m²	(272) ÷ (4) =				13.4	(273)
EI rating (section 14)					90	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	890.11	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2274.86	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3164.96	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	719.79	(267)
Electricity for lighting	(232) x		0	=	829.84	(268)
'Total Primary Energy	sum of (265)…(271) =				4714.58	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				79.24	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 14

Address : FLAT 14, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	59.5 (1a)	x	2.3 (2a)	=	136.85	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	59.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	136.85	(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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	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	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.75	x1/[1/(1.4)+ 0.04]		=	4.97			(27)
Windows Type 2			1.17	x1/[1/(1.4)+ 0.04]		=	1.55			(27)
Windows Type 3			1.94	x1/[1/(1.4)+ 0.04]		=	2.57			(27)
Windows Type 4			1.43	x1/[1/(1.4)+ 0.04]		=	1.9			(27)
Windows Type 5			1.42	x1/[1/(1.4)+ 0.04]		=	1.88			(27)
Windows Type 6			1.16	x1/[1/(1.4)+ 0.04]		=	1.54			(27)
Windows Type 7			1.9	x1/[1/(1.4)+ 0.04]		=	2.52			(27)
Walls Type1	62.56	12.77	49.79	x	0.18	=	8.96			(29)
Walls Type2	9.43	2.1	7.33	x	0.18	=	1.32			(29)
Roof	1.2	0	1.2	x	0.13	=	0.16			(30)
Total area of elements, m²			73.19							(31)
Party wall			11.73	x	0	=	0			(32)
Party floor			59.5							(32a)
Party ceiling			58.3							(32b)
Internal wall **			112.7							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.47 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5010.38 (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 — 3.66 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 33.13 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.04	25.91	25.77	25.16	25.04	24.5	24.5	24.4	24.71	25.04	25.27	25.52	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	59.17	59.03	58.9	58.28	58.17	57.63	57.63	57.53	57.84	58.17	58.4	58.65	

Average = Sum(39)$_{1...12}$ /12= 58.28 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.99	0.99	0.99	0.98	0.98	0.97	0.97	0.97	0.97	0.98	0.98	0.99	

Average = Sum(40)$_{1...12}$ /12= 0.98 (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 — 1.97 (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 — 80.93 (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=	89.02	85.78	82.55	79.31	76.07	72.83	72.83	76.07	79.31	82.55	85.78	89.02	

Total = Sum(44)$_{1...12}$ = 971.13 (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=	132.01	115.46	119.14	103.87	99.67	86.01	79.7	91.45	92.55	107.85	117.73	127.85	

Total = Sum(45)$_{1...12}$ = 1273.3 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.8	17.32	17.87	15.58	14.95	12.9	11.95	13.72	13.88	16.18	17.66	19.18	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.55 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (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)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	181.26	159.94	168.39	151.53	148.91	133.66	128.94	140.7	140.2	157.1	165.39	177.09	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	181.26	159.94	168.39	151.53	148.91	133.66	128.94	140.7	140.2	157.1	165.39	177.09	

Output from water heater (annual)$_{1...12}$ — 1853.09 — (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=	83.29	73.97	79.01	72.66	72.53	66.72	65.89	69.8	68.9	75.26	77.27	81.9	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	98.37	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.33	13.61	11.07	8.38	6.27	5.29	5.72	7.43	9.97	12.66	14.78	15.75	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	171.68	173.47	168.98	159.42	147.35	136.02	128.44	126.66	131.15	140.71	152.77	164.11	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	32.84	(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=	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	-78.7	(71)

Water heating gains (Table 5)

(72)m=	111.95	110.08	106.2	100.92	97.49	92.67	88.57	93.82	95.69	101.15	107.32	110.09	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	354.47	352.67	341.76	324.23	306.62	289.48	278.23	283.42	292.32	310.03	330.38	345.46	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9x	0.77	x	1.16	x	10.63	x	0.63	x	0.7	=	3.77	(74)
North 0.9x	0.77	x	1.16	x	20.32	x	0.63	x	0.7	=	7.2	(74)
North 0.9x	0.77	x	1.16	x	34.53	x	0.63	x	0.7	=	12.24	(74)
North 0.9x	0.77	x	1.16	x	55.46	x	0.63	x	0.7	=	19.66	(74)
North 0.9x	0.77	x	1.16	x	74.72	x	0.63	x	0.7	=	26.49	(74)
North 0.9x	0.77	x	1.16	x	79.99	x	0.63	x	0.7	=	28.36	(74)
North 0.9x	0.77	x	1.16	x	74.68	x	0.63	x	0.7	=	26.47	(74)
North 0.9x	0.77	x	1.16	x	59.25	x	0.63	x	0.7	=	21	(74)
North 0.9x	0.77	x	1.16	x	41.52	x	0.63	x	0.7	=	14.72	(74)
North 0.9x	0.77	x	1.16	x	24.19	x	0.63	x	0.7	=	8.58	(74)
North 0.9x	0.77	x	1.16	x	13.12	x	0.63	x	0.7	=	4.65	(74)
North 0.9x	0.77	x	1.16	x	8.86	x	0.63	x	0.7	=	3.14	(74)
Northeast 0.9x	0.77	x	1.42	x	11.28	x	0.63	x	0.7	=	4.9	(75)
Northeast 0.9x	0.77	x	1.42	x	22.97	x	0.63	x	0.7	=	9.97	(75)
Northeast 0.9x	0.77	x	1.42	x	41.38	x	0.63	x	0.7	=	17.96	(75)
Northeast 0.9x	0.77	x	1.42	x	67.96	x	0.63	x	0.7	=	29.49	(75)
Northeast 0.9x	0.77	x	1.42	x	91.35	x	0.63	x	0.7	=	39.64	(75)
Northeast 0.9x	0.77	x	1.42	x	97.38	x	0.63	x	0.7	=	42.26	(75)
Northeast 0.9x	0.77	x	1.42	x	91.1	x	0.63	x	0.7	=	39.54	(75)
Northeast 0.9x	0.77	x	1.42	x	72.63	x	0.63	x	0.7	=	31.52	(75)
Northeast 0.9x	0.77	x	1.42	x	50.42	x	0.63	x	0.7	=	21.88	(75)
Northeast 0.9x	0.77	x	1.42	x	28.07	x	0.63	x	0.7	=	12.18	(75)
Northeast 0.9x	0.77	x	1.42	x	14.2	x	0.63	x	0.7	=	6.16	(75)
Northeast 0.9x	0.77	x	1.42	x	9.21	x	0.63	x	0.7	=	4	(75)
East 0.9x	0.77	x	1.9	x	19.64	x	0.63	x	0.7	=	11.4	(76)
East 0.9x	0.77	x	1.9	x	38.42	x	0.63	x	0.7	=	22.31	(76)
East 0.9x	0.77	x	1.9	x	63.27	x	0.63	x	0.7	=	36.74	(76)
East 0.9x	0.77	x	1.9	x	92.28	x	0.63	x	0.7	=	53.58	(76)
East 0.9x	0.77	x	1.9	x	113.09	x	0.63	x	0.7	=	65.67	(76)
East 0.9x	0.77	x	1.9	x	115.77	x	0.63	x	0.7	=	67.22	(76)
East 0.9x	0.77	x	1.9	x	110.22	x	0.63	x	0.7	=	64	(76)
East 0.9x	0.77	x	1.9	x	94.68	x	0.63	x	0.7	=	54.97	(76)
East 0.9x	0.77	x	1.9	x	73.59	x	0.63	x	0.7	=	42.73	(76)
East 0.9x	0.77	x	1.9	x	45.59	x	0.63	x	0.7	=	26.47	(76)
East 0.9x	0.77	x	1.9	x	24.49	x	0.63	x	0.7	=	14.22	(76)
East 0.9x	0.77	x	1.9	x	16.15	x	0.63	x	0.7	=	9.38	(76)
South 0.9x	0.77	x	1.17	x	46.75	x	0.63	x	0.7	=	16.72	(78)
South 0.9x	0.77	x	1.17	x	76.57	x	0.63	x	0.7	=	27.38	(78)
South 0.9x	0.77	x	1.17	x	97.53	x	0.63	x	0.7	=	34.87	(78)

TER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	1.17	x	110.23	x	0.63	x	0.7	=	39.42	(78)
South	0.9x	0.77	x	1.17	x	114.87	x	0.63	x	0.7	=	41.07	(78)
South	0.9x	0.77	x	1.17	x	110.55	x	0.63	x	0.7	=	39.53	(78)
South	0.9x	0.77	x	1.17	x	108.01	x	0.63	x	0.7	=	38.62	(78)
South	0.9x	0.77	x	1.17	x	104.89	x	0.63	x	0.7	=	37.51	(78)
South	0.9x	0.77	x	1.17	x	101.89	x	0.63	x	0.7	=	36.43	(78)
South	0.9x	0.77	x	1.17	x	82.59	x	0.63	x	0.7	=	29.53	(78)
South	0.9x	0.77	x	1.17	x	55.42	x	0.63	x	0.7	=	19.82	(78)
South	0.9x	0.77	x	1.17	x	40.4	x	0.63	x	0.7	=	14.45	(78)
West	0.9x	0.77	x	3.75	x	19.64	x	0.63	x	0.7	=	22.51	(80)
West	0.9x	0.77	x	1.94	x	19.64	x	0.63	x	0.7	=	11.64	(80)
West	0.9x	0.77	x	3.75	x	38.42	x	0.63	x	0.7	=	44.03	(80)
West	0.9x	0.77	x	1.94	x	38.42	x	0.63	x	0.7	=	22.78	(80)
West	0.9x	0.77	x	3.75	x	63.27	x	0.63	x	0.7	=	72.51	(80)
West	0.9x	0.77	x	1.94	x	63.27	x	0.63	x	0.7	=	37.51	(80)
West	0.9x	0.77	x	3.75	x	92.28	x	0.63	x	0.7	=	105.76	(80)
West	0.9x	0.77	x	1.94	x	92.28	x	0.63	x	0.7	=	54.71	(80)
West	0.9x	0.77	x	3.75	x	113.09	x	0.63	x	0.7	=	129.61	(80)
West	0.9x	0.77	x	1.94	x	113.09	x	0.63	x	0.7	=	67.05	(80)
West	0.9x	0.77	x	3.75	x	115.77	x	0.63	x	0.7	=	132.68	(80)
West	0.9x	0.77	x	1.94	x	115.77	x	0.63	x	0.7	=	68.64	(80)
West	0.9x	0.77	x	3.75	x	110.22	x	0.63	x	0.7	=	126.32	(80)
West	0.9x	0.77	x	1.94	x	110.22	x	0.63	x	0.7	=	65.35	(80)
West	0.9x	0.77	x	3.75	x	94.68	x	0.63	x	0.7	=	108.5	(80)
West	0.9x	0.77	x	1.94	x	94.68	x	0.63	x	0.7	=	56.13	(80)
West	0.9x	0.77	x	3.75	x	73.59	x	0.63	x	0.7	=	84.34	(80)
West	0.9x	0.77	x	1.94	x	73.59	x	0.63	x	0.7	=	43.63	(80)
West	0.9x	0.77	x	3.75	x	45.59	x	0.63	x	0.7	=	52.25	(80)
West	0.9x	0.77	x	1.94	x	45.59	x	0.63	x	0.7	=	27.03	(80)
West	0.9x	0.77	x	3.75	x	24.49	x	0.63	x	0.7	=	28.07	(80)
West	0.9x	0.77	x	1.94	x	24.49	x	0.63	x	0.7	=	14.52	(80)
West	0.9x	0.77	x	3.75	x	16.15	x	0.63	x	0.7	=	18.51	(80)
West	0.9x	0.77	x	1.94	x	16.15	x	0.63	x	0.7	=	9.58	(80)
Northwest	0.9x	0.77	x	1.43	x	11.28	x	0.63	x	0.7	=	4.93	(81)
Northwest	0.9x	0.77	x	1.43	x	22.97	x	0.63	x	0.7	=	10.04	(81)
Northwest	0.9x	0.77	x	1.43	x	41.38	x	0.63	x	0.7	=	18.08	(81)
Northwest	0.9x	0.77	x	1.43	x	67.96	x	0.63	x	0.7	=	29.7	(81)
Northwest	0.9x	0.77	x	1.43	x	91.35	x	0.63	x	0.7	=	39.92	(81)
Northwest	0.9x	0.77	x	1.43	x	97.38	x	0.63	x	0.7	=	42.56	(81)
Northwest	0.9x	0.77	x	1.43	x	91.1	x	0.63	x	0.7	=	39.81	(81)
Northwest	0.9x	0.77	x	1.43	x	72.63	x	0.63	x	0.7	=	31.74	(81)

TER WorkSheet: New dwelling design stage

Northwest 0.9x	0.77	x	1.43	x	50.42	x	0.63	x	0.7	=	22.04	(81)
Northwest 0.9x	0.77	x	1.43	x	28.07	x	0.63	x	0.7	=	12.27	(81)
Northwest 0.9x	0.77	x	1.43	x	14.2	x	0.63	x	0.7	=	6.2	(81)
Northwest 0.9x	0.77	x	1.43	x	9.21	x	0.63	x	0.7	=	4.03	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	75.87	143.71	229.93	332.32	409.45	421.25	400.11	341.38	265.76	168.3	93.64	63.08	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	430.34	496.38	571.68	656.55	716.08	710.73	678.34	624.8	558.08	478.33	424.01	408.54	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.96	0.88	0.71	0.51	0.37	0.42	0.68	0.93	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.09	20.25	20.51	20.79	20.95	20.99	21	21	20.97	20.74	20.36	20.06	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.09	20.09	20.09	20.1	20.1	20.11	20.11	20.11	20.11	20.1	20.1	20.1	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.85	0.66	0.44	0.3	0.34	0.61	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=	18.88	19.12	19.48	19.87	20.06	20.11	20.11	20.11	20.09	19.82	19.28	18.84	(90)

fLA = Living area ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.41	19.61	19.93	20.27	20.45	20.49	20.5	20.5	20.47	20.22	19.75	19.37	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.41	19.61	19.93	20.27	20.45	20.49	20.5	20.5	20.47	20.22	19.75	19.37	(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	0.68	0.47	0.33	0.38	0.64	0.91	0.98	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	426.74	487.23	543.36	561.63	485.74	337.13	224.39	235.25	356.34	435.04	416.28	405.9	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	894.03	868.59	791.05	662.94	508.78	339.63	224.64	235.77	368.53	559.58	739	889.89	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	347.66	256.28	184.28	72.94	17.15	0	0	0	0	92.66	232.36	360.09	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1563.42 (98)

Space heating requirement in kWh/m²/year 26.28 (99)

TER WorkSheet: New dwelling design stage

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)													
	347.66	256.28	184.28	72.94	17.15	0	0	0	0	92.66	232.36	360.09	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	371.83	274.09	197.1	78.01	18.34	0	0	0	0	99.1	248.51	385.12	
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													1672.1 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	181.26	159.94	168.39	151.53	148.91	133.66	128.94	140.7	140.2	157.1	165.39	177.09	
Efficiency of water heater													79.8 (216)
(217)m=	86.52	86.07	85.05	82.99	80.79	79.8	79.8	79.8	79.8	83.46	85.72	86.67	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	209.49	185.83	197.98	182.59	184.33	167.49	161.58	176.31	175.69	188.23	192.94	204.33	
Total = Sum(219a)$_{1...12}$ =													2226.78 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1672.1
Water heating fuel used		2226.78
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75 (231)
Electricity for lighting		270.68 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4244.57 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	361.17	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	480.98	(264)

TER WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			842.16	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	140.48	(268)
Total CO2, kg/year	sum of (265)…(271) =			1021.57	(272)

TER = 24.95 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:53

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 58.2m²

Site Reference : 43LS **Plot Reference:** FLAT 15

Address : FLAT 15, 43 London Street, Reading, RG1 4PS

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)	23.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.24 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	33.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	31.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	0.94 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	6.92m²
Windows facing: South	1.71m²
Windows facing: North	2.1m²
Windows facing: South	2.81m²
Windows facing: West	2.81m²
Ventilation rate:	6.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 15

Address : FLAT 15, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	58.2 (1a)	x	2.3 (2a)	=	133.86	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	58.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	133.86	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34

(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=

0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.92	x	1/[1/(0.92)+ 0.04]	=	6.14			(27)
Windows Type 2			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Windows Type 5			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	50.83	16.35	34.48	x	0.16	=	5.52	14	482.72	(29)
Walls Type2	6.21	2.1	4.11	x	0.14	=	0.58	14	57.54	(29)
Total area of elements, m²			57.04							(31)
Party wall			26.22	x	0	=	0	20	524.4	(32)
Party floor			58.2					30	1746	(32a)
Party ceiling			58.2					20	1164	(32b)
Internal wall **			98.44					9	885.96	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.86 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4860.62 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 83.52 (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 8.56 (36)

DER WorkSheet: New dwelling design stage

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.42 (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=	15.99	15.79	15.6	14.63	14.44	13.47	13.47	13.28	13.86	14.44	14.83	15.21	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	47.4	47.21	47.02	46.05	45.86	44.89	44.89	44.7	45.28	45.86	46.24	46.63	

Average = Sum(39)$_{1...12}$ /12= 46 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.81	0.81	0.81	0.79	0.79	0.77	0.77	0.77	0.78	0.79	0.79	0.8	

Average = Sum(40)$_{1...12}$ /12= 0.79 (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 1.93 (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 80.04 (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=	88.05	84.85	81.65	78.44	75.24	72.04	72.04	75.24	78.44	81.65	84.85	88.05	

Total = Sum(44)$_{1...12}$ = 960.54 (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=	130.57	114.2	117.85	102.74	98.58	85.07	78.83	90.46	91.54	106.68	116.45	126.45	

Total = Sum(45)$_{1...12}$ = 1259.42 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.59	17.13	17.68	15.41	14.79	12.76	11.82	13.57	13.73	16	17.47	18.97	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.45 (55)

DER WorkSheet: New dwelling design stage

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	144.64	126.9	131.91	116.35	112.64	98.68	92.89	104.52	105.15	120.74	130.06	140.52	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	144.64	126.9	131.91	116.35	112.64	98.68	92.89	104.52	105.15	120.74	130.06	140.52	

Output from water heater (annual)$_{1...12}$ — 1424.98 — (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=	43.42	37.97	39.18	34.16	32.78	28.29	26.21	30.08	30.44	35.47	38.72	42.05	(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=	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.01	13.33	10.84	8.21	6.14	5.18	5.6	7.28	9.77	12.4	14.47	15.43	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	168.39	170.13	165.73	156.36	144.52	133.4	125.97	124.22	128.63	138	149.83	160.96	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	(71)

Water heating gains (Table 5)

(72)m=	58.35	56.51	52.67	47.45	44.06	39.29	35.23	40.43	42.27	47.68	53.78	56.51	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	301.74	299.96	289.23	272	254.7	237.85	226.79	231.91	240.65	258.06	278.07	292.88	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x	0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x	0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x	0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x	0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x	0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x	0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x	0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x	0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x	0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x	0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x	0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
East	0.9x	0.77	x	6.92	x	19.64	x	0.51	x	0.8	=	38.43	(76)
East	0.9x	0.77	x	6.92	x	38.42	x	0.51	x	0.8	=	75.17	(76)
East	0.9x	0.77	x	6.92	x	63.27	x	0.51	x	0.8	=	123.8	(76)
East	0.9x	0.77	x	6.92	x	92.28	x	0.51	x	0.8	=	180.55	(76)
East	0.9x	0.77	x	6.92	x	113.09	x	0.51	x	0.8	=	221.28	(76)
East	0.9x	0.77	x	6.92	x	115.77	x	0.51	x	0.8	=	226.52	(76)
East	0.9x	0.77	x	6.92	x	110.22	x	0.51	x	0.8	=	215.65	(76)
East	0.9x	0.77	x	6.92	x	94.68	x	0.51	x	0.8	=	185.24	(76)
East	0.9x	0.77	x	6.92	x	73.59	x	0.51	x	0.8	=	143.98	(76)
East	0.9x	0.77	x	6.92	x	45.59	x	0.51	x	0.8	=	89.2	(76)
East	0.9x	0.77	x	6.92	x	24.49	x	0.51	x	0.8	=	47.92	(76)
East	0.9x	0.77	x	6.92	x	16.15	x	0.51	x	0.8	=	31.6	(76)
South	0.9x	0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x	0.77	x	2.81	x	46.75	x	0.63	x	0.7	=	40.15	(78)
South	0.9x	0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x	0.77	x	2.81	x	76.57	x	0.63	x	0.7	=	65.75	(78)
South	0.9x	0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x	0.77	x	2.81	x	97.53	x	0.63	x	0.7	=	83.76	(78)
South	0.9x	0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x	0.77	x	2.81	x	110.23	x	0.63	x	0.7	=	94.67	(78)
South	0.9x	0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)
South	0.9x	0.77	x	2.81	x	114.87	x	0.63	x	0.7	=	98.65	(78)
South	0.9x	0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x	0.77	x	2.81	x	110.55	x	0.63	x	0.7	=	94.94	(78)
South	0.9x	0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x	0.77	x	2.81	x	108.01	x	0.63	x	0.7	=	92.76	(78)
South	0.9x	0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	2.81	x	104.89	x	0.63	x	0.7	=	90.08	(78)
South	0.9x	0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x	0.77	x	2.81	x	101.89	x	0.63	x	0.7	=	87.5	(78)
South	0.9x	0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x	0.77	x	2.81	x	82.59	x	0.63	x	0.7	=	70.92	(78)
South	0.9x	0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	2.81	x	55.42	x	0.63	x	0.7	=	47.59	(78)
South	0.9x	0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)
South	0.9x	0.77	x	2.81	x	40.4	x	0.63	x	0.7	=	34.69	(78)
West	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)
West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	126.7	226.98	335.03	447.67	525.03	529.98	507.44	449.47	374.57	257.96	153.92	106.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	428.44	526.94	624.25	719.67	779.73	767.83	734.22	681.38	615.22	516.02	431.99	399.85	(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=	0.91	0.86	0.78	0.65	0.5	0.36	0.27	0.3	0.47	0.72	0.87	0.93	(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=	20.59	20.59	20.6	20.6	20.61	20.61	20.61	20.62	20.61	20.61	20.6	20.6	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.91	0.85	0.77	0.63	0.48	0.34	0.24	0.27	0.45	0.7	0.86	0.92	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.59	20.59	20.6	20.6	20.61	20.61	20.61	20.62	20.61	20.61	20.6	20.6	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

DER WorkSheet: New dwelling design stage

(92)m=	20.77	20.78	20.78	20.78	20.78	20.79	20.79	20.79	20.78	20.78	20.78	20.78	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.77	20.78	20.78	20.78	20.78	20.79	20.79	20.79	20.78	20.78	20.78	20.78	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.91	0.86	0.77	0.64	0.49	0.35	0.25	0.28	0.46	0.71	0.87	0.92	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	390.89	451.76	481.23	458.94	383.46	269.23	185.6	192.82	283.04	365.94	374.77	369.62	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	780.95	749.48	671.23	547.13	416.47	277.72	187.94	196.11	302.67	466.92	632.62	773.05	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	290.2	200.07	141.36	63.5	24.56	0	0	0	0	75.13	185.65	300.15	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1280.62 (98)

Space heating requirement in kWh/m²/year 22 (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 1 500.15 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	290.2	200.07	141.36	63.5	24.56	0	0	0	0	75.13	185.65	300.15	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	58.02	40	28.26	12.7	4.91	0	0	0	0	15.02	37.12	60.01	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 256.05 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	144.64	126.9	131.91	116.35	112.64	98.68	92.89	104.52	105.15	120.74	130.06	140.52	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	74.49	65.35	67.93	59.92	58.01	50.82	47.84	53.83	54.15	62.18	66.98	72.36	

Total = Sum(219a)$_{1...12}$ = 733.85 (219)

DER WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		256.05	
Water heating fuel used		733.85	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	149.02		(230a)
warm air heating system fans	80.32		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		229.34	(231)
Electricity for lighting		265.11	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1484.34	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	132.89	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	380.87	(264)
Space and water heating	(261) + (262) + (263) + (264) =				513.75	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	119.03	(267)
Electricity for lighting	(232) x		0.519	=	137.59	(268)
Total CO2, kg/year		sum of (265)…(271) =			770.37	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			13.24	(273)
EI rating (section 14)					90	(274)

Predicted Energy Assessment

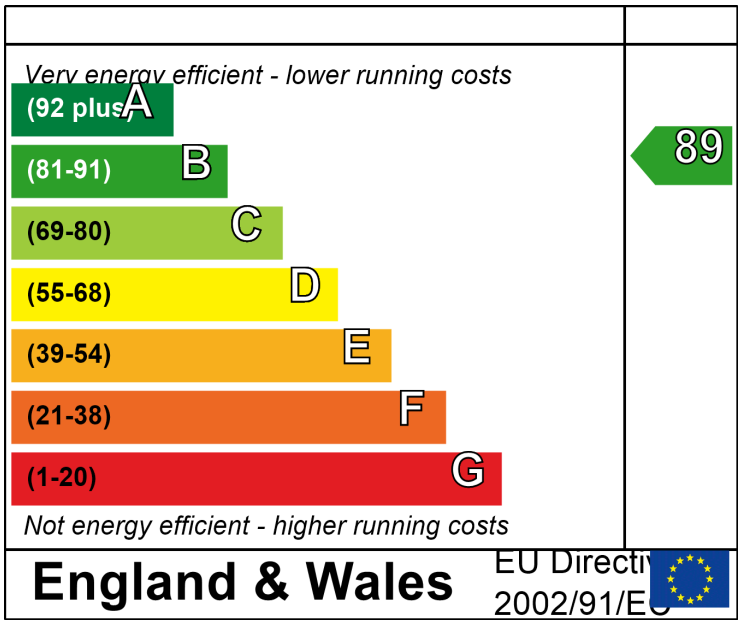
FLAT 15
43 London Street
Reading
RG1 4PS

Dwelling type:	Mid floor Flat
Date of assessment:	23 June 2025
Produced by:	Ondrej Gajdos
Total floor area:	58.2 m²

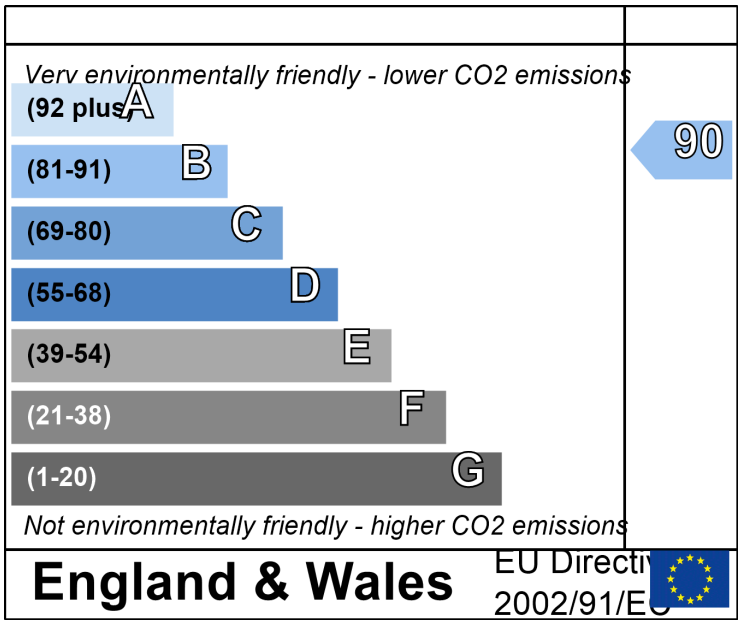
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 15

Address : FLAT 15, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	58.2 (1a)	x	2.3 (2a)	=	133.86	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	58.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	133.86	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34

(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=

0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.92	x1/[1/(0.92)+ 0.04]		=	6.14			(27)
Windows Type 2			1.71	x1/[1/(1.1)+ 0.04]		=	1.8			(27)
Windows Type 3			2.1	x1/[1/(1.1)+ 0.04]		=	2.21			(27)
Windows Type 4			2.81	x1/[1/(1.1)+ 0.04]		=	2.96			(27)
Windows Type 5			2.81	x1/[1/(1.1)+ 0.04]		=	2.96			(27)
Walls Type1	50.83	16.35	34.48	x	0.16	=	5.52	14	482.72	(29)
Walls Type2	6.21	2.1	4.11	x	0.14	=	0.58	14	57.54	(29)
Total area of elements, m²			57.04							(31)
Party wall			26.22	x	0	=	0	20	524.4	(32)
Party floor			58.2					30	1746	(32a)
Party ceiling			58.2					20	1164	(32b)
Internal wall **			98.44					9	885.96	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.86 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4860.62 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 83.52 (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 8.56 (36)

SAP WorkSheet: New dwelling design stage

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.42 (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=	15.99	15.79	15.6	14.63	14.44	13.47	13.47	13.28	13.86	14.44	14.83	15.21	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	47.4	47.21	47.02	46.05	45.86	44.89	44.89	44.7	45.28	45.86	46.24	46.63	

Average = Sum(39)$_{1...12}$ /12= 46 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.81	0.81	0.81	0.79	0.79	0.77	0.77	0.77	0.78	0.79	0.79	0.8	

Average = Sum(40)$_{1...12}$ /12= 0.79 (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 1.93 (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 80.04 (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=	88.05	84.85	81.65	78.44	75.24	72.04	72.04	75.24	78.44	81.65	84.85	88.05	

Total = Sum(44)$_{1...12}$ = 960.54 (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=	130.57	114.2	117.85	102.74	98.58	85.07	78.83	90.46	91.54	106.68	116.45	126.45	

Total = Sum(45)$_{1...12}$ = 1259.42 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.59	17.13	17.68	15.41	14.79	12.76	11.82	13.57	13.73	16	17.47	18.97	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.45 (55)

SAP WorkSheet: New dwelling design stage

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	144.64	126.9	131.91	116.35	112.64	98.68	92.89	104.52	105.15	120.74	130.06	140.52	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	144.64	126.9	131.91	116.35	112.64	98.68	92.89	104.52	105.15	120.74	130.06	140.52	

Output from water heater (annual)$_{1...12}$ — 1424.98 — (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=	43.42	37.97	39.18	34.16	32.78	28.29	26.21	30.08	30.44	35.47	38.72	42.05	(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=	115.82	115.82	115.82	115.82	115.82	115.82	115.82	115.82	115.82	115.82	115.82	115.82	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	37.53	33.33	27.11	20.52	15.34	12.95	13.99	18.19	24.42	31	36.18	38.57	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	251.32	253.93	247.36	233.37	215.71	199.11	188.02	185.41	191.98	205.97	223.63	240.23	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48.51	48.51	48.51	48.51	48.51	48.51	48.51	48.51	48.51	48.51	48.51	48.51	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	(71)

Water heating gains (Table 5)

(72)m=	58.35	56.51	52.67	47.45	44.06	39.29	35.23	40.43	42.27	47.68	53.78	56.51	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	442.36	438.92	422.28	396.49	370.25	346.49	332.39	339.18	353.82	379.8	408.74	430.47	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x 0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x 0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x 0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x 0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x 0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x 0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x 0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x 0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x 0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x 0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
East	0.9x 0.77	x	6.92	x	19.64	x	0.51	x	0.8	=	38.43	(76)
East	0.9x 0.77	x	6.92	x	38.42	x	0.51	x	0.8	=	75.17	(76)
East	0.9x 0.77	x	6.92	x	63.27	x	0.51	x	0.8	=	123.8	(76)
East	0.9x 0.77	x	6.92	x	92.28	x	0.51	x	0.8	=	180.55	(76)
East	0.9x 0.77	x	6.92	x	113.09	x	0.51	x	0.8	=	221.28	(76)
East	0.9x 0.77	x	6.92	x	115.77	x	0.51	x	0.8	=	226.52	(76)
East	0.9x 0.77	x	6.92	x	110.22	x	0.51	x	0.8	=	215.65	(76)
East	0.9x 0.77	x	6.92	x	94.68	x	0.51	x	0.8	=	185.24	(76)
East	0.9x 0.77	x	6.92	x	73.59	x	0.51	x	0.8	=	143.98	(76)
East	0.9x 0.77	x	6.92	x	45.59	x	0.51	x	0.8	=	89.2	(76)
East	0.9x 0.77	x	6.92	x	24.49	x	0.51	x	0.8	=	47.92	(76)
East	0.9x 0.77	x	6.92	x	16.15	x	0.51	x	0.8	=	31.6	(76)
South	0.9x 0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x 0.77	x	2.81	x	46.75	x	0.63	x	0.7	=	40.15	(78)
South	0.9x 0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x 0.77	x	2.81	x	76.57	x	0.63	x	0.7	=	65.75	(78)
South	0.9x 0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x 0.77	x	2.81	x	97.53	x	0.63	x	0.7	=	83.76	(78)
South	0.9x 0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x 0.77	x	2.81	x	110.23	x	0.63	x	0.7	=	94.67	(78)
South	0.9x 0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)
South	0.9x 0.77	x	2.81	x	114.87	x	0.63	x	0.7	=	98.65	(78)
South	0.9x 0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x 0.77	x	2.81	x	110.55	x	0.63	x	0.7	=	94.94	(78)
South	0.9x 0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x 0.77	x	2.81	x	108.01	x	0.63	x	0.7	=	92.76	(78)
South	0.9x 0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	2.81	x	104.89	x	0.63	x	0.7	=	90.08	(78)
South	0.9x	0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x	0.77	x	2.81	x	101.89	x	0.63	x	0.7	=	87.5	(78)
South	0.9x	0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x	0.77	x	2.81	x	82.59	x	0.63	x	0.7	=	70.92	(78)
South	0.9x	0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	2.81	x	55.42	x	0.63	x	0.7	=	47.59	(78)
South	0.9x	0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)
South	0.9x	0.77	x	2.81	x	40.4	x	0.63	x	0.7	=	34.69	(78)
West	0.9x	0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x	0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x	0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)
West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	126.7	226.98	335.03	447.67	525.03	529.98	507.44	449.47	374.57	257.96	153.92	106.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	569.06	665.9	757.31	844.16	895.28	876.47	839.83	788.65	728.39	637.76	562.66	537.43	(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=	0.85	0.79	0.7	0.58	0.45	0.32	0.23	0.26	0.41	0.63	0.79	0.87	(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=	20.59	20.59	20.6	20.6	20.61	20.61	20.61	20.62	20.61	20.61	20.6	20.6	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.84	0.78	0.69	0.56	0.43	0.3	0.21	0.24	0.39	0.62	0.78	0.86	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.59	20.59	20.6	20.6	20.61	20.61	20.61	20.62	20.61	20.61	20.6	20.6	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

SAP WorkSheet: New dwelling design stage

(92)m=	20.77	20.78	20.78	20.78	20.78	20.79	20.79	20.79	20.78	20.78	20.78	20.78	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.77	20.78	20.78	20.78	20.78	20.79	20.79	20.79	20.78	20.78	20.78	20.78	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.85	0.79	0.7	0.57	0.44	0.31	0.22	0.25	0.4	0.62	0.79	0.86	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	482.05	523.54	528.65	481.94	392.24	271.66	186.31	193.88	289.44	396.92	443.69	463.2	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	780.95	749.48	671.23	547.13	416.47	277.72	187.94	196.11	302.67	466.92	632.62	773.05	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	222.38	151.83	106.08	46.94	18.03	0	0	0	0	52.08	136.03	230.53	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 963.9 (98)

Space heating requirement in kWh/m²/year 16.56 (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 1 500.15 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	222.38	151.83	106.08	46.94	18.03	0	0	0	0	52.08	136.03	230.53	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	44.46	30.36	21.21	9.38	3.61	0	0	0	0	10.41	27.2	46.09	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 192.72 (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)

	144.64	126.9	131.91	116.35	112.64	98.68	92.89	104.52	105.15	120.74	130.06	140.52	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	74.49	65.35	67.93	59.92	58.01	50.82	47.84	53.83	54.15	62.18	66.98	72.36	

Total = Sum(219a)$_{1...12}$ = 733.85 (219)

SAP WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		192.72	
Water heating fuel used		733.85	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	149.02		(230a)
warm air heating system fans	80.32		(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		229.34	(231)
Electricity for lighting		265.11	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1421.01	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	25.42	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	96.79	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	30.25	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a					
Energy for lighting	(232)	13.19	x 0.01 =	34.97	(250)
Additional standing charges (Table 12)				0	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost (245)...(247) + (250)…(254) =				187.43	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.76	(257)
SAP rating (Section 12)	89.36	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	100.02	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	380.87	(264)
Space and water heating	(261) + (262) + (263) + (264) =			480.89	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	119.03	(267)
Electricity for lighting	(232) x	0.519	=	137.59	(268)
Total CO2, kg/year sum of (265)…(271) =				737.51	(272)

SAP WorkSheet: New dwelling design stage

CO2 emissions per m²	(272) ÷ (4) =	12.67	(273)
EI rating (section 14)		90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	591.65	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	2252.91	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2844.56	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	704.06	(267)
Electricity for lighting	(232)	x	0	=	813.89	(268)
‘Total Primary Energy	sum of (265)…(271) =				4362.51	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				74.96	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 15

Address : FLAT 15, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	58.2 (1a)	x	2.3 (2a)	=	133.86	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	58.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	133.86	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.31	0.33

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=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			5.27	x1/[1/(1.4)+ 0.04]		=	6.99			(27)
Windows Type 2			1.3	x1/[1/(1.4)+ 0.04]		=	1.72			(27)
Windows Type 3			1.6	x1/[1/(1.4)+ 0.04]		=	2.12			(27)
Windows Type 4			2.14	x1/[1/(1.4)+ 0.04]		=	2.84			(27)
Windows Type 5			2.14	x1/[1/(1.4)+ 0.04]		=	2.84			(27)
Walls Type1	50.83	12.45	38.38	x	0.18	=	6.91			(29)
Walls Type2	6.21	2.1	4.11	x	0.18	=	0.74			(29)
Total area of elements, m²			57.04							(31)
Party wall			26.22	x	0	=	0			(32)
Party floor			58.2							(32a)
Party ceiling			58.2							(32b)
Internal wall **			98.44							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 26.25 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4915.22 (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 2.85 (36)

TER WorkSheet: New dwelling design stage

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 29.11 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	24.89	24.78	24.68	24.18	24.08	23.65	23.65	23.56	23.81	24.08	24.27	24.47	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	54	53.89	53.78	53.28	53.19	52.75	52.75	52.67	52.92	53.19	53.38	53.58	

Average = Sum(39)$_{1...12}$ /12= 53.28 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.93	0.93	0.92	0.92	0.91	0.91	0.91	0.9	0.91	0.91	0.92	0.92	

Average = Sum(40)$_{1...12}$ /12= 0.92 (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 1.93 (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 80.04 (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=	88.05	84.85	81.65	78.44	75.24	72.04	72.04	75.24	78.44	81.65	84.85	88.05	

Total = Sum(44)$_{1...12}$ = 960.54 (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=	130.57	114.2	117.85	102.74	98.58	85.07	78.83	90.46	91.54	106.68	116.45	126.45	

Total = Sum(45)$_{1...12}$ = 1259.42 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.59	17.13	17.68	15.41	14.79	12.76	11.82	13.57	13.73	16	17.47	18.97	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (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) 0.84 (55)

TER WorkSheet: New dwelling design stage

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	179.82	158.68	167.09	150.39	147.82	132.72	128.07	139.7	139.19	155.92	164.1	175.7	(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=	179.82	158.68	167.09	150.39	147.82	132.72	128.07	139.7	139.19	155.92	164.1	175.7	

Output from water heater (annual)$_{1...12}$ | 1839.21 | (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=	82.81	73.55	78.58	72.28	72.17	66.41	65.6	69.47	68.56	74.86	76.84	81.44	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	96.52	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.04	13.35	10.86	8.22	6.15	5.19	5.61	7.29	9.78	12.42	14.5	15.45	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	168.39	170.13	165.73	156.36	144.52	133.4	125.97	124.22	128.63	138	149.83	160.96	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	32.65	(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=	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	-77.21	(71)

Water heating gains (Table 5)

(72)m=	111.3	109.46	105.62	100.4	97.01	92.23	88.18	93.38	95.22	100.62	106.73	109.46	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	349.68	347.9	337.16	319.93	302.63	285.78	274.71	279.84	288.59	306	326.01	340.83	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.6	x	10.63	x	0.63	x	0.7	=	5.2	(74)
North	0.9x	0.77	x	1.6	x	20.32	x	0.63	x	0.7	=	9.94	(74)
North	0.9x	0.77	x	1.6	x	34.53	x	0.63	x	0.7	=	16.88	(74)
North	0.9x	0.77	x	1.6	x	55.46	x	0.63	x	0.7	=	27.12	(74)
North	0.9x	0.77	x	1.6	x	74.72	x	0.63	x	0.7	=	36.53	(74)
North	0.9x	0.77	x	1.6	x	79.99	x	0.63	x	0.7	=	39.11	(74)
North	0.9x	0.77	x	1.6	x	74.68	x	0.63	x	0.7	=	36.52	(74)
North	0.9x	0.77	x	1.6	x	59.25	x	0.63	x	0.7	=	28.97	(74)
North	0.9x	0.77	x	1.6	x	41.52	x	0.63	x	0.7	=	20.3	(74)
North	0.9x	0.77	x	1.6	x	24.19	x	0.63	x	0.7	=	11.83	(74)
North	0.9x	0.77	x	1.6	x	13.12	x	0.63	x	0.7	=	6.41	(74)
North	0.9x	0.77	x	1.6	x	8.86	x	0.63	x	0.7	=	4.33	(74)
East	0.9x	0.77	x	5.27	x	19.64	x	0.63	x	0.7	=	31.63	(76)
East	0.9x	0.77	x	5.27	x	38.42	x	0.63	x	0.7	=	61.88	(76)
East	0.9x	0.77	x	5.27	x	63.27	x	0.63	x	0.7	=	101.91	(76)
East	0.9x	0.77	x	5.27	x	92.28	x	0.63	x	0.7	=	148.62	(76)
East	0.9x	0.77	x	5.27	x	113.09	x	0.63	x	0.7	=	182.14	(76)
East	0.9x	0.77	x	5.27	x	115.77	x	0.63	x	0.7	=	186.46	(76)
East	0.9x	0.77	x	5.27	x	110.22	x	0.63	x	0.7	=	177.52	(76)
East	0.9x	0.77	x	5.27	x	94.68	x	0.63	x	0.7	=	152.48	(76)
East	0.9x	0.77	x	5.27	x	73.59	x	0.63	x	0.7	=	118.52	(76)
East	0.9x	0.77	x	5.27	x	45.59	x	0.63	x	0.7	=	73.43	(76)
East	0.9x	0.77	x	5.27	x	24.49	x	0.63	x	0.7	=	39.44	(76)
East	0.9x	0.77	x	5.27	x	16.15	x	0.63	x	0.7	=	26.01	(76)
South	0.9x	0.77	x	1.3	x	46.75	x	0.63	x	0.7	=	18.57	(78)
South	0.9x	0.77	x	2.14	x	46.75	x	0.63	x	0.7	=	30.58	(78)
South	0.9x	0.77	x	1.3	x	76.57	x	0.63	x	0.7	=	30.42	(78)
South	0.9x	0.77	x	2.14	x	76.57	x	0.63	x	0.7	=	50.08	(78)
South	0.9x	0.77	x	1.3	x	97.53	x	0.63	x	0.7	=	38.75	(78)
South	0.9x	0.77	x	2.14	x	97.53	x	0.63	x	0.7	=	63.79	(78)
South	0.9x	0.77	x	1.3	x	110.23	x	0.63	x	0.7	=	43.8	(78)
South	0.9x	0.77	x	2.14	x	110.23	x	0.63	x	0.7	=	72.09	(78)
South	0.9x	0.77	x	1.3	x	114.87	x	0.63	x	0.7	=	45.64	(78)
South	0.9x	0.77	x	2.14	x	114.87	x	0.63	x	0.7	=	75.13	(78)
South	0.9x	0.77	x	1.3	x	110.55	x	0.63	x	0.7	=	43.92	(78)
South	0.9x	0.77	x	2.14	x	110.55	x	0.63	x	0.7	=	72.3	(78)
South	0.9x	0.77	x	1.3	x	108.01	x	0.63	x	0.7	=	42.91	(78)
South	0.9x	0.77	x	2.14	x	108.01	x	0.63	x	0.7	=	70.64	(78)
South	0.9x	0.77	x	1.3	x	104.89	x	0.63	x	0.7	=	41.67	(78)

TER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	2.14	x	104.89	x	0.63	x	0.7	=	68.6	(78)
South	0.9x	0.77	x	1.3	x	101.89	x	0.63	x	0.7	=	40.48	(78)
South	0.9x	0.77	x	2.14	x	101.89	x	0.63	x	0.7	=	66.63	(78)
South	0.9x	0.77	x	1.3	x	82.59	x	0.63	x	0.7	=	32.81	(78)
South	0.9x	0.77	x	2.14	x	82.59	x	0.63	x	0.7	=	54.01	(78)
South	0.9x	0.77	x	1.3	x	55.42	x	0.63	x	0.7	=	22.02	(78)
South	0.9x	0.77	x	2.14	x	55.42	x	0.63	x	0.7	=	36.24	(78)
South	0.9x	0.77	x	1.3	x	40.4	x	0.63	x	0.7	=	16.05	(78)
South	0.9x	0.77	x	2.14	x	40.4	x	0.63	x	0.7	=	26.42	(78)
West	0.9x	0.77	x	2.14	x	19.64	x	0.63	x	0.7	=	12.84	(80)
West	0.9x	0.77	x	2.14	x	38.42	x	0.63	x	0.7	=	25.13	(80)
West	0.9x	0.77	x	2.14	x	63.27	x	0.63	x	0.7	=	41.38	(80)
West	0.9x	0.77	x	2.14	x	92.28	x	0.63	x	0.7	=	60.35	(80)
West	0.9x	0.77	x	2.14	x	113.09	x	0.63	x	0.7	=	73.96	(80)
West	0.9x	0.77	x	2.14	x	115.77	x	0.63	x	0.7	=	75.72	(80)
West	0.9x	0.77	x	2.14	x	110.22	x	0.63	x	0.7	=	72.08	(80)
West	0.9x	0.77	x	2.14	x	94.68	x	0.63	x	0.7	=	61.92	(80)
West	0.9x	0.77	x	2.14	x	73.59	x	0.63	x	0.7	=	48.13	(80)
West	0.9x	0.77	x	2.14	x	45.59	x	0.63	x	0.7	=	29.82	(80)
West	0.9x	0.77	x	2.14	x	24.49	x	0.63	x	0.7	=	16.02	(80)
West	0.9x	0.77	x	2.14	x	16.15	x	0.63	x	0.7	=	10.56	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	98.83	177.44	262.71	351.99	413.41	417.5	399.67	353.65	294.06	201.89	120.13	83.38	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	448.51	525.34	599.87	671.92	716.04	703.28	674.38	633.49	582.65	507.89	446.14	424.21	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.94	0.84	0.67	0.48	0.34	0.38	0.61	0.89	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.23	20.41	20.64	20.86	20.97	21	21	21	20.99	20.83	20.49	20.19	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.14	20.15	20.15	20.15	20.16	20.16	20.16	20.16	20.16	20.16	20.15	20.15	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.97	0.93	0.81	0.61	0.42	0.28	0.31	0.54	0.86	0.97	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.13	19.38	19.71	20.01	20.13	20.16	20.16	20.16	20.15	19.98	19.51	19.08	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

TER WorkSheet: New dwelling design stage

(92)m=	19.62	19.84	20.13	20.39	20.51	20.53	20.54	20.54	20.52	20.36	19.94	19.58	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.62	19.84	20.13	20.39	20.51	20.53	20.54	20.54	20.52	20.36	19.94	19.58	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.97	0.93	0.82	0.64	0.44	0.31	0.34	0.57	0.87	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	443.19	510.5	556.55	547.94	455.37	311.77	207.53	217.67	334.5	440.67	433.96	420.41	(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=	827.4	805.11	732.83	612.29	468.35	313.01	207.64	217.87	339.93	519.07	685.62	823.92	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	285.85	197.98	131.16	46.33	9.66	0	0	0	0	58.33	181.19	300.21	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1210.7 (98)

Space heating requirement in kWh/m²/year 20.8 (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)													
	285.85	197.98	131.16	46.33	9.66	0	0	0	0	58.33	181.19	300.21	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	305.72	211.74	140.28	49.55	10.33	0	0	0	0	62.38	193.79	321.08	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1294.87 (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)

	179.82	158.68	167.09	150.39	147.82	132.72	128.07	139.7	139.19	155.92	164.1	175.7	

Efficiency of water heater 79.8 (216)

(217)m=	86.04	85.41	84.18	82.09	80.38	79.8	79.8	79.8	79.8	82.45	85.08	86.23	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.98	185.8	198.5	183.22	183.9	166.32	160.49	175.06	174.43	189.1	192.88	203.75	

Total = Sum(219a)$_{1...12}$ = 2222.42 (219)

TER WorkSheet: New dwelling design stage

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		1294.87	
Water heating fuel used		2222.42	
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		265.53	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3857.82	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	279.69	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	480.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =				759.74	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	137.81	(268)
Total CO2, kg/year	sum of (265)…(271) =				936.47	(272)

TER = 23.27 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:50

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.3m²

Site Reference : 43LS **Plot Reference:** FLAT 16

Address : FLAT 16, 43 London Street, Reading, RG1 4PS

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)	27.65 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.44 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	48.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	0.97 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Very Little
Windows facing: West	5.54m²
Windows facing: South	1.73m²
Windows facing: West	2.87m²
Windows facing: North	4.29m²
Windows facing: North	1.71m²
Windows facing: East	2.34m²
Windows facing: South	2.81m²
Ventilation rate:	4.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Roofs U-value	0.11 W/m²K
External Walls U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 16

Address : FLAT 16, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.3	(1a) x	2.25	(2a) =	137.92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		137.92	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)				0 (9)
Additional infiltration			[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction				0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0				0 (12)
If no draught lobby, enter 0.05, else enter 0				0 (13)
Percentage of windows and doors draught stripped				0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =			0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =			0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (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) =			0.19 (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

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37

(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=

0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			5.54	x	1/[1/(0.92)+ 0.04]	=	4.92			(27)
Windows Type 2			1.73	x	1/[1/(0.92)+ 0.04]	=	1.54			(27)
Windows Type 3			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 4			4.29	x	1/[1/(1.1)+ 0.04]	=	4.52			(27)
Windows Type 5			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 6			2.34	x	1/[1/(1.1)+ 0.04]	=	2.47			(27)
Windows Type 7			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	30.38	21.29	9.09	x	0.16	=	1.45	14	127.26	(29)
Walls Type2	10.66	2.1	8.56	x	0.14	=	1.2	14	119.84	(29)
Walls Type3	5.5	0	5.5	x	0.12	=	0.66	14	77	(29)
Walls Type4	31.22	0	31.22	x	0.12	=	3.75	14	437.08	(29)
Roof Type1	34.8	0	34.8	x	0.11	=	3.83	9	313.2	(30)
Roof Type2	22.2	0	22.2	x	0.11	=	2.44	9	199.8	(30)
Total area of elements, m²			134.76							(31)
Party wall			6.5	x	0	=	0	20	130	(32)
Party floor			61.3					30	1839	(32a)
Party ceiling			5					20	100	(32b)
Internal wall **			128.6					9	1157.4	(32c)

DER WorkSheet: New dwelling design stage

** 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) =	35.25	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	4500.58	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	= (34) ÷ (4) =	73.42	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K		20.21	(36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	55.46	(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=	17.56	17.34	17.12	16.02	15.8	14.69	14.69	14.47	15.13	15.8	16.24	16.68	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	73.02	72.8	72.58	71.47	71.25	70.15	70.15	69.93	70.59	71.25	71.7	72.14	

Average = Sum(39)$_{1...12}$ /12= 71.42 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.19	1.19	1.18	1.17	1.16	1.14	1.14	1.14	1.15	1.16	1.17	1.18	

Average = Sum(40)$_{1...12}$ /12= 1.17 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1	2.02	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 *Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)*	82.13	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	90.34	87.06	83.77	80.49	77.2	73.92	73.92	77.2	80.49	83.77	87.06	90.34	

Total = Sum(44)$_{1...12}$ = 985.57 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	133.98	117.18	120.92	105.42	101.15	87.29	80.88	92.81	93.92	109.46	119.48	129.75	

Total = Sum(45)$_{1...12}$ = 1292.24 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.1	17.58	18.14	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel	180	(47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):	0.54	(48)
Temperature factor from Table 2b	0.4536	(49)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	148.04	129.88	134.98	119.03	115.21	100.89	94.94	106.88	107.53	123.52	133.09	143.81	(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=	148.04	129.88	134.98	119.03	115.21	100.89	94.94	106.88	107.53	123.52	133.09	143.81	

Output from water heater (annual)$_{1...12}$ 1457.8 (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=	44.55	38.96	40.2	35.05	33.63	29.02	26.89	30.86	31.23	36.39	39.73	43.14	(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=	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.71	13.95	11.35	8.59	6.42	5.42	5.86	7.61	10.22	12.98	15.15	16.15	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	176.21	178.04	173.43	163.62	151.24	139.6	131.83	130	134.61	144.42	156.8	168.44	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	(71)

DER WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=	59.88	57.98	54.04	48.68	45.21	40.31	36.15	41.48	43.37	48.92	55.18	57.99	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	313.35	311.52	300.37	282.45	264.42	246.88	235.38	240.64	249.75	267.86	288.67	304.12	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	4.29	x	10.63	x	0.63	x	0.7	=	13.94	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	4.29	x	20.32	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	4.29	x	34.53	x	0.63	x	0.7	=	45.27	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	4.29	x	55.46	x	0.63	x	0.7	=	72.72	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	4.29	x	74.72	x	0.63	x	0.7	=	97.96	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	4.29	x	79.99	x	0.63	x	0.7	=	104.87	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	4.29	x	74.68	x	0.63	x	0.7	=	97.91	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	4.29	x	59.25	x	0.63	x	0.7	=	77.68	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	4.29	x	41.52	x	0.63	x	0.7	=	54.43	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	4.29	x	24.19	x	0.63	x	0.7	=	31.71	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	4.29	x	13.12	x	0.63	x	0.7	=	17.2	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	4.29	x	8.86	x	0.63	x	0.7	=	11.62	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	2.34	x	19.64	x	0.63	x	0.7	=	14.05	(76)
East	0.9x 0.77	x	2.34	x	38.42	x	0.63	x	0.7	=	27.48	(76)
East	0.9x 0.77	x	2.34	x	63.27	x	0.63	x	0.7	=	45.25	(76)
East	0.9x 0.77	x	2.34	x	92.28	x	0.63	x	0.7	=	65.99	(76)
East	0.9x 0.77	x	2.34	x	113.09	x	0.63	x	0.7	=	80.88	(76)
East	0.9x 0.77	x	2.34	x	115.77	x	0.63	x	0.7	=	82.79	(76)
East	0.9x 0.77	x	2.34	x	110.22	x	0.63	x	0.7	=	78.82	(76)
East	0.9x 0.77	x	2.34	x	94.68	x	0.63	x	0.7	=	67.71	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	2.34	x	73.59	x	0.63	x	0.7	=	52.63	(76)
East	0.9x	0.77	x	2.34	x	45.59	x	0.63	x	0.7	=	32.6	(76)
East	0.9x	0.77	x	2.34	x	24.49	x	0.63	x	0.7	=	17.51	(76)
East	0.9x	0.77	x	2.34	x	16.15	x	0.63	x	0.7	=	11.55	(76)
South	0.9x	0.77	x	1.73	x	46.75	x	0.51	x	0.8	=	22.87	(78)
South	0.9x	0.77	x	2.81	x	46.75	x	0.63	x	0.7	=	40.15	(78)
South	0.9x	0.77	x	1.73	x	76.57	x	0.51	x	0.8	=	37.45	(78)
South	0.9x	0.77	x	2.81	x	76.57	x	0.63	x	0.7	=	65.75	(78)
South	0.9x	0.77	x	1.73	x	97.53	x	0.51	x	0.8	=	47.71	(78)
South	0.9x	0.77	x	2.81	x	97.53	x	0.63	x	0.7	=	83.76	(78)
South	0.9x	0.77	x	1.73	x	110.23	x	0.51	x	0.8	=	53.92	(78)
South	0.9x	0.77	x	2.81	x	110.23	x	0.63	x	0.7	=	94.67	(78)
South	0.9x	0.77	x	1.73	x	114.87	x	0.51	x	0.8	=	56.19	(78)
South	0.9x	0.77	x	2.81	x	114.87	x	0.63	x	0.7	=	98.65	(78)
South	0.9x	0.77	x	1.73	x	110.55	x	0.51	x	0.8	=	54.07	(78)
South	0.9x	0.77	x	2.81	x	110.55	x	0.63	x	0.7	=	94.94	(78)
South	0.9x	0.77	x	1.73	x	108.01	x	0.51	x	0.8	=	52.83	(78)
South	0.9x	0.77	x	2.81	x	108.01	x	0.63	x	0.7	=	92.76	(78)
South	0.9x	0.77	x	1.73	x	104.89	x	0.51	x	0.8	=	51.31	(78)
South	0.9x	0.77	x	2.81	x	104.89	x	0.63	x	0.7	=	90.08	(78)
South	0.9x	0.77	x	1.73	x	101.89	x	0.51	x	0.8	=	49.84	(78)
South	0.9x	0.77	x	2.81	x	101.89	x	0.63	x	0.7	=	87.5	(78)
South	0.9x	0.77	x	1.73	x	82.59	x	0.51	x	0.8	=	40.4	(78)
South	0.9x	0.77	x	2.81	x	82.59	x	0.63	x	0.7	=	70.92	(78)
South	0.9x	0.77	x	1.73	x	55.42	x	0.51	x	0.8	=	27.11	(78)
South	0.9x	0.77	x	2.81	x	55.42	x	0.63	x	0.7	=	47.59	(78)
South	0.9x	0.77	x	1.73	x	40.4	x	0.51	x	0.8	=	19.76	(78)
South	0.9x	0.77	x	2.81	x	40.4	x	0.63	x	0.7	=	34.69	(78)
West	0.9x	0.77	x	5.54	x	19.64	x	0.51	x	0.8	=	30.76	(80)
West	0.9x	0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(80)
West	0.9x	0.77	x	5.54	x	38.42	x	0.51	x	0.8	=	60.18	(80)
West	0.9x	0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(80)
West	0.9x	0.77	x	5.54	x	63.27	x	0.51	x	0.8	=	99.11	(80)
West	0.9x	0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(80)
West	0.9x	0.77	x	5.54	x	92.28	x	0.51	x	0.8	=	144.55	(80)
West	0.9x	0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(80)
West	0.9x	0.77	x	5.54	x	113.09	x	0.51	x	0.8	=	177.15	(80)
West	0.9x	0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(80)
West	0.9x	0.77	x	5.54	x	115.77	x	0.51	x	0.8	=	181.34	(80)
West	0.9x	0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(80)
West	0.9x	0.77	x	5.54	x	110.22	x	0.51	x	0.8	=	172.65	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(80)
West	0.9x	0.77	x	5.54	x	94.68	x	0.51	x	0.8	=	148.3	(80)
West	0.9x	0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(80)
West	0.9x	0.77	x	5.54	x	73.59	x	0.51	x	0.8	=	115.27	(80)
West	0.9x	0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(80)
West	0.9x	0.77	x	5.54	x	45.59	x	0.51	x	0.8	=	71.41	(80)
West	0.9x	0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(80)
West	0.9x	0.77	x	5.54	x	24.49	x	0.51	x	0.8	=	38.36	(80)
West	0.9x	0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(80)
West	0.9x	0.77	x	5.54	x	16.15	x	0.51	x	0.8	=	25.3	(80)
West	0.9x	0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	144.55	261.83	394.64	541.77	649.06	661.35	630.66	549.08	445.9	299.67	176.1	121.72	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	457.9	573.35	695.01	824.22	913.48	908.24	866.05	789.72	695.65	567.53	464.78	425.84	(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=	0.92	0.88	0.81	0.7	0.57	0.43	0.33	0.37	0.56	0.77	0.89	0.93	(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=	20.4	20.41	20.41	20.42	20.42	20.43	20.43	20.43	20.42	20.42	20.42	20.41	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.91	0.87	0.8	0.68	0.55	0.4	0.29	0.33	0.53	0.75	0.88	0.92	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.4	20.41	20.41	20.42	20.42	20.43	20.43	20.43	20.42	20.42	20.42	20.41	(90)

fLA = Living area ÷ (4) = 0.41 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.65	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.65	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(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=	0.92	0.87	0.8	0.69	0.56	0.42	0.31	0.35	0.54	0.76	0.88	0.93	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	419.75	500.24	557.75	569.27	508.1	378.03	267.61	275.11	375.24	431.3	410.28	394.63	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

DER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1193.65	1146.45	1026.93	840.17	638.14	425.2	284.9	298.06	463.02	716.52	971.74	1186.76	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	575.78	434.25	349.07	195.05	96.75	0	0	0	0	212.21	404.25	589.34	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2856.7 (98)

Space heating requirement in kWh/m²/year 46.6 (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 1 511.29 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	575.78	434.25	349.07	195.05	96.75	0	0	0	0	212.21	404.25	589.34	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	112.61	84.93	68.27	38.15	18.92	0	0	0	0	41.5	79.07	115.27	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 558.73 (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)

	148.04	129.88	134.98	119.03	115.21	100.89	94.94	106.88	107.53	123.52	133.09	143.81	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	76.24	66.89	69.51	61.3	59.33	51.96	48.9	55.04	55.38	63.61	68.54	74.06	

Total = Sum(219a)$_{1...12}$ = 750.75 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		558.73
Water heating fuel used		750.75
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	153.55	(230a)
warm air heating system fans	82.75	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		236.3 (231)
Electricity for lighting		277.44 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1823.21 (338)

DER WorkSheet: New dwelling design stage

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	=	289.98	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	389.64	(264)
Space and water heating	(261) + (262) + (263) + (264) =				679.62	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	122.64	(267)
Electricity for lighting	(232) x		0.519	=	143.99	(268)
Total CO2, kg/year		sum of (265)…(271) =			946.25	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			15.44	(273)
EI rating (section 14)					88	(274)

Predicted Energy Assessment

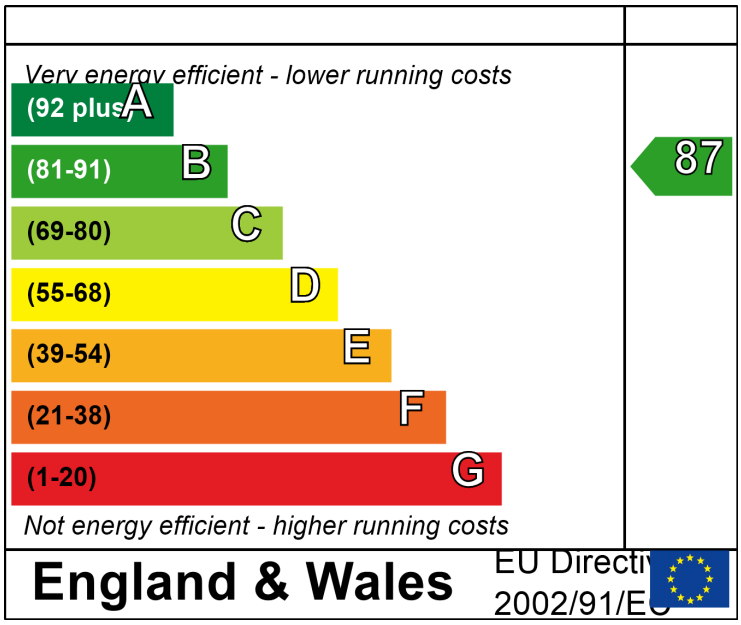
FLAT 16
43 London Street
Reading
RG1 4PS

Dwelling type: Top floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 61.3 m²

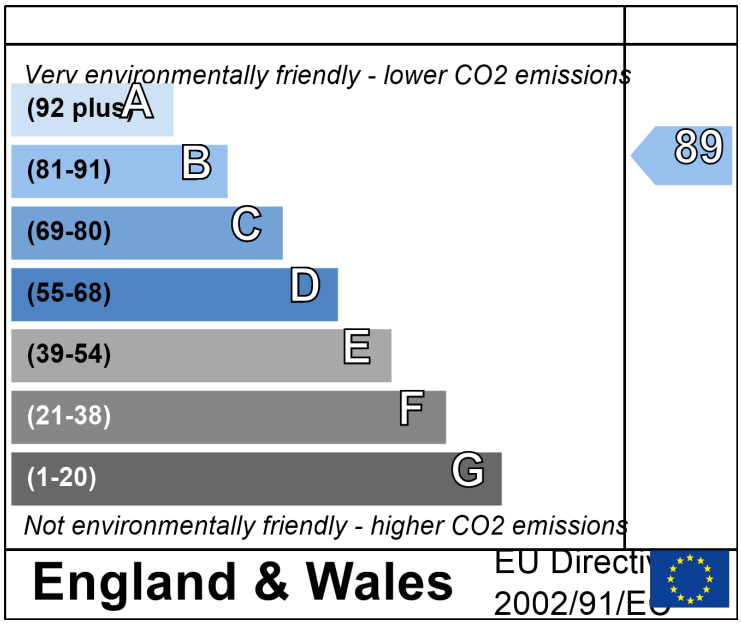
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 16

Address : FLAT 16, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.3 (1a)	x	2.25 (2a)	=	137.92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	137.92	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)				
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(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) =	0.19	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.25	0.24	0.24	0.21	0.21	0.18	0.18	0.18	0.19	0.21	0.22	0.23

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37

(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=

0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.32	0.33	0.35	0.36	0.37

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			5.54	x	1/[1/(0.92)+ 0.04]	=	4.92			(27)
Windows Type 2			1.73	x	1/[1/(0.92)+ 0.04]	=	1.54			(27)
Windows Type 3			2.87	x	1/[1/(1.1)+ 0.04]	=	3.02			(27)
Windows Type 4			4.29	x	1/[1/(1.1)+ 0.04]	=	4.52			(27)
Windows Type 5			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 6			2.34	x	1/[1/(1.1)+ 0.04]	=	2.47			(27)
Windows Type 7			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	30.38	21.29	9.09	x	0.16	=	1.45	14	127.26	(29)
Walls Type2	10.66	2.1	8.56	x	0.14	=	1.2	14	119.84	(29)
Walls Type3	5.5	0	5.5	x	0.12	=	0.66	14	77	(29)
Walls Type4	31.22	0	31.22	x	0.12	=	3.75	14	437.08	(29)
Roof Type1	34.8	0	34.8	x	0.11	=	3.83	9	313.2	(30)
Roof Type2	22.2	0	22.2	x	0.11	=	2.44	9	199.8	(30)
Total area of elements, m²			134.76							(31)
Party wall			6.5	x	0	=	0	20	130	(32)
Party floor			61.3					30	1839	(32a)
Party ceiling			5					20	100	(32b)
Internal wall **			128.6					9	1157.4	(32c)

SAP WorkSheet: New dwelling design stage

** 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) = 35.25 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4500.58 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 73.42 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 20.21 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 55.46 (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=	17.56	17.34	17.12	16.02	15.8	14.69	14.69	14.47	15.13	15.8	16.24	16.68	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	73.02	72.8	72.58	71.47	71.25	70.15	70.15	69.93	70.59	71.25	71.7	72.14	

Average = Sum(39)$_{1...12}$ /12= 71.42 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.19	1.19	1.18	1.17	1.16	1.14	1.14	1.14	1.15	1.16	1.17	1.18	

Average = Sum(40)$_{1...12}$ /12= 1.17 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.02 (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 82.13 (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=	90.34	87.06	83.77	80.49	77.2	73.92	73.92	77.2	80.49	83.77	87.06	90.34	

Total = Sum(44)$_{1...12}$ = 985.57 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	133.98	117.18	120.92	105.42	101.15	87.29	80.88	92.81	93.92	109.46	119.48	129.75	

Total = Sum(45)$_{1...12}$ = 1292.24 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.1	17.58	18.14	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)
Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	148.04	129.88	134.98	119.03	115.21	100.89	94.94	106.88	107.53	123.52	133.09	143.81	(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=	148.04	129.88	134.98	119.03	115.21	100.89	94.94	106.88	107.53	123.52	133.09	143.81	

Output from water heater (annual)$_{1...12}$ 1457.8 (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=	44.55	38.96	40.2	35.05	33.63	29.02	26.89	30.86	31.23	36.39	39.73	43.14	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	39.27	34.88	28.37	21.48	16.05	13.55	14.65	19.04	25.55	32.44	37.86	40.37	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	263	265.73	258.86	244.22	225.73	208.36	196.76	194.03	200.91	215.55	234.03	251.4	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	(69)

Pumps and fans gains (Table 5a)

(70)m=	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	(71)

SAP WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=	59.88	57.98	54.04	48.68	45.21	40.31	36.15	41.48	43.37	48.92	55.18	57.99	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	459.92	456.36	439.03	412.14	384.76	359.99	345.32	352.31	367.6	394.67	424.84	447.52	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	4.29	x	10.63	x	0.63	x	0.7	=	13.94	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	4.29	x	20.32	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	4.29	x	34.53	x	0.63	x	0.7	=	45.27	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	4.29	x	55.46	x	0.63	x	0.7	=	72.72	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	4.29	x	74.72	x	0.63	x	0.7	=	97.96	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	4.29	x	79.99	x	0.63	x	0.7	=	104.87	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	4.29	x	74.68	x	0.63	x	0.7	=	97.91	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	4.29	x	59.25	x	0.63	x	0.7	=	77.68	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	4.29	x	41.52	x	0.63	x	0.7	=	54.43	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	4.29	x	24.19	x	0.63	x	0.7	=	31.71	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	4.29	x	13.12	x	0.63	x	0.7	=	17.2	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	4.29	x	8.86	x	0.63	x	0.7	=	11.62	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	2.34	x	19.64	x	0.63	x	0.7	=	14.05	(76)
East	0.9x 0.77	x	2.34	x	38.42	x	0.63	x	0.7	=	27.48	(76)
East	0.9x 0.77	x	2.34	x	63.27	x	0.63	x	0.7	=	45.25	(76)
East	0.9x 0.77	x	2.34	x	92.28	x	0.63	x	0.7	=	65.99	(76)
East	0.9x 0.77	x	2.34	x	113.09	x	0.63	x	0.7	=	80.88	(76)
East	0.9x 0.77	x	2.34	x	115.77	x	0.63	x	0.7	=	82.79	(76)
East	0.9x 0.77	x	2.34	x	110.22	x	0.63	x	0.7	=	78.82	(76)
East	0.9x 0.77	x	2.34	x	94.68	x	0.63	x	0.7	=	67.71	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	2.34	x	73.59	x	0.63	x	0.7	=	52.63	(76)
East	0.9x	0.77	x	2.34	x	45.59	x	0.63	x	0.7	=	32.6	(76)
East	0.9x	0.77	x	2.34	x	24.49	x	0.63	x	0.7	=	17.51	(76)
East	0.9x	0.77	x	2.34	x	16.15	x	0.63	x	0.7	=	11.55	(76)
South	0.9x	0.77	x	1.73	x	46.75	x	0.51	x	0.8	=	22.87	(78)
South	0.9x	0.77	x	2.81	x	46.75	x	0.63	x	0.7	=	40.15	(78)
South	0.9x	0.77	x	1.73	x	76.57	x	0.51	x	0.8	=	37.45	(78)
South	0.9x	0.77	x	2.81	x	76.57	x	0.63	x	0.7	=	65.75	(78)
South	0.9x	0.77	x	1.73	x	97.53	x	0.51	x	0.8	=	47.71	(78)
South	0.9x	0.77	x	2.81	x	97.53	x	0.63	x	0.7	=	83.76	(78)
South	0.9x	0.77	x	1.73	x	110.23	x	0.51	x	0.8	=	53.92	(78)
South	0.9x	0.77	x	2.81	x	110.23	x	0.63	x	0.7	=	94.67	(78)
South	0.9x	0.77	x	1.73	x	114.87	x	0.51	x	0.8	=	56.19	(78)
South	0.9x	0.77	x	2.81	x	114.87	x	0.63	x	0.7	=	98.65	(78)
South	0.9x	0.77	x	1.73	x	110.55	x	0.51	x	0.8	=	54.07	(78)
South	0.9x	0.77	x	2.81	x	110.55	x	0.63	x	0.7	=	94.94	(78)
South	0.9x	0.77	x	1.73	x	108.01	x	0.51	x	0.8	=	52.83	(78)
South	0.9x	0.77	x	2.81	x	108.01	x	0.63	x	0.7	=	92.76	(78)
South	0.9x	0.77	x	1.73	x	104.89	x	0.51	x	0.8	=	51.31	(78)
South	0.9x	0.77	x	2.81	x	104.89	x	0.63	x	0.7	=	90.08	(78)
South	0.9x	0.77	x	1.73	x	101.89	x	0.51	x	0.8	=	49.84	(78)
South	0.9x	0.77	x	2.81	x	101.89	x	0.63	x	0.7	=	87.5	(78)
South	0.9x	0.77	x	1.73	x	82.59	x	0.51	x	0.8	=	40.4	(78)
South	0.9x	0.77	x	2.81	x	82.59	x	0.63	x	0.7	=	70.92	(78)
South	0.9x	0.77	x	1.73	x	55.42	x	0.51	x	0.8	=	27.11	(78)
South	0.9x	0.77	x	2.81	x	55.42	x	0.63	x	0.7	=	47.59	(78)
South	0.9x	0.77	x	1.73	x	40.4	x	0.51	x	0.8	=	19.76	(78)
South	0.9x	0.77	x	2.81	x	40.4	x	0.63	x	0.7	=	34.69	(78)
West	0.9x	0.77	x	5.54	x	19.64	x	0.51	x	0.8	=	30.76	(80)
West	0.9x	0.77	x	2.87	x	19.64	x	0.63	x	0.7	=	17.23	(80)
West	0.9x	0.77	x	5.54	x	38.42	x	0.51	x	0.8	=	60.18	(80)
West	0.9x	0.77	x	2.87	x	38.42	x	0.63	x	0.7	=	33.7	(80)
West	0.9x	0.77	x	5.54	x	63.27	x	0.51	x	0.8	=	99.11	(80)
West	0.9x	0.77	x	2.87	x	63.27	x	0.63	x	0.7	=	55.5	(80)
West	0.9x	0.77	x	5.54	x	92.28	x	0.51	x	0.8	=	144.55	(80)
West	0.9x	0.77	x	2.87	x	92.28	x	0.63	x	0.7	=	80.94	(80)
West	0.9x	0.77	x	5.54	x	113.09	x	0.51	x	0.8	=	177.15	(80)
West	0.9x	0.77	x	2.87	x	113.09	x	0.63	x	0.7	=	99.19	(80)
West	0.9x	0.77	x	5.54	x	115.77	x	0.51	x	0.8	=	181.34	(80)
West	0.9x	0.77	x	2.87	x	115.77	x	0.63	x	0.7	=	101.54	(80)
West	0.9x	0.77	x	5.54	x	110.22	x	0.51	x	0.8	=	172.65	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.87	x	110.22	x	0.63	x	0.7	=	96.67	(80)
West	0.9x	0.77	x	5.54	x	94.68	x	0.51	x	0.8	=	148.3	(80)
West	0.9x	0.77	x	2.87	x	94.68	x	0.63	x	0.7	=	83.04	(80)
West	0.9x	0.77	x	5.54	x	73.59	x	0.51	x	0.8	=	115.27	(80)
West	0.9x	0.77	x	2.87	x	73.59	x	0.63	x	0.7	=	64.55	(80)
West	0.9x	0.77	x	5.54	x	45.59	x	0.51	x	0.8	=	71.41	(80)
West	0.9x	0.77	x	2.87	x	45.59	x	0.63	x	0.7	=	39.99	(80)
West	0.9x	0.77	x	5.54	x	24.49	x	0.51	x	0.8	=	38.36	(80)
West	0.9x	0.77	x	2.87	x	24.49	x	0.63	x	0.7	=	21.48	(80)
West	0.9x	0.77	x	5.54	x	16.15	x	0.51	x	0.8	=	25.3	(80)
West	0.9x	0.77	x	2.87	x	16.15	x	0.63	x	0.7	=	14.17	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	144.55	261.83	394.64	541.77	649.06	661.35	630.66	549.08	445.9	299.67	176.1	121.72	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	604.47	718.19	833.67	953.91	1033.82	1021.35	975.98	901.39	813.5	694.35	600.94	569.24	(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=	0.87	0.83	0.76	0.65	0.52	0.4	0.3	0.33	0.5	0.71	0.83	0.89	(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=	20.4	20.41	20.41	20.42	20.42	20.43	20.43	20.43	20.42	20.42	20.42	20.41	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.87	0.82	0.74	0.63	0.5	0.37	0.26	0.3	0.47	0.69	0.82	0.88	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.4	20.41	20.41	20.42	20.42	20.43	20.43	20.43	20.42	20.42	20.42	20.41	(90)

fLA = Living area ÷ (4) = 0.41 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.65	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.65	20.65	20.65	20.65	20.66	20.66	20.66	20.66	20.66	20.66	20.65	20.65	(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=	0.87	0.82	0.75	0.64	0.51	0.38	0.28	0.31	0.48	0.7	0.83	0.88	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	525.68	590.46	625.38	610.29	528.68	386.35	270.99	279.89	392.99	482.71	497.12	501.81	(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)

SAP WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(97)m=	1193.65	1146.45	1026.93	840.17	638.14	425.2	284.9	298.06	463.02	716.52	971.74	1186.76	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m=	496.97	373.62	298.75	165.51	81.44	0	0	0	0	173.96	341.72	509.6	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2441.58 (98)

Space heating requirement in kWh/m²/year 39.83 (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 1 511.29 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	496.97	373.62	298.75	165.51	81.44	0	0	0	0	173.96	341.72	509.6	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	97.2	73.08	58.43	32.37	15.93	0	0	0	0	34.02	66.84	99.67	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 477.54 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	148.04	129.88	134.98	119.03	115.21	100.89	94.94	106.88	107.53	123.52	133.09	143.81	

Efficiency of water heater 194.18 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(219)m=	76.24	66.89	69.51	61.3	59.33	51.96	48.9	55.04	55.38	63.61	68.54	74.06	

Total = Sum(219a)$_{1...12}$ = 750.75 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		477.54
Water heating fuel used		750.75
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	153.55	(230a)
warm air heating system fans	82.75	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		236.3 (231)
Electricity for lighting		277.44 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1742.02 (338)

SAP WorkSheet: New dwelling design stage

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	62.99		(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0		(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0		(242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	99.02		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	31.17		(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)	13.19	x 0.01 =	36.59		(250)
Additional standing charges (Table 12)				0		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =			229.77		(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.91	(257)
SAP rating (Section 12)		87.34	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.519	=	247.84		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.519	=	389.64		(264)
Space and water heating	(261) + (262) + (263) + (264) =			637.48		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	122.64		(267)
Electricity for lighting	(232) x	0.519	=	143.99		(268)
Total CO2, kg/year	sum of (265)...(271) =			904.11		(272)
CO2 emissions per m²	(272) ÷ (4) =			14.75		(273)
EI rating (section 14)				89		(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	3.07	=	1466.04		(261)
Space heating (secondary)	(215) x	3.07	=	0		(263)
Energy for water heating	(219) x	3.07	=	2304.8		(264)
Space and water heating	(261) + (262) + (263) + (264) =			3770.84		(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	725.44	(267)
Electricity for lighting	(232)	x	0	=	851.73	(268)
'Total Primary Energy			sum of (265)…(271) =		5348	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		87.24	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 16

Address : FLAT 16, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.3 (1a)	x	2.25 (2a)	=	137.92	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	137.92	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.15	(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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.34	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	0.56	(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	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.44	x1/[1/(1.4)+ 0.04]		=	4.56			(27)
Windows Type 2			1.07	x1/[1/(1.4)+ 0.04]		=	1.42			(27)
Windows Type 3			1.78	x1/[1/(1.4)+ 0.04]		=	2.36			(27)
Windows Type 4			2.66	x1/[1/(1.4)+ 0.04]		=	3.53			(27)
Windows Type 5			1.06	x1/[1/(1.4)+ 0.04]		=	1.41			(27)
Windows Type 6			1.45	x1/[1/(1.4)+ 0.04]		=	1.92			(27)
Windows Type 7			1.75	x1/[1/(1.4)+ 0.04]		=	2.32			(27)
Walls Type1	30.38	13.21	17.17	x	0.18	=	3.09			(29)
Walls Type2	10.66	2.1	8.56	x	0.18	=	1.54			(29)
Walls Type3	5.5	0	5.5	x	0.18	=	0.99			(29)
Walls Type4	31.22	0	31.22	x	0.18	=	5.62			(29)
Roof Type1	34.8	0	34.8	x	0.13	=	4.52			(30)
Roof Type2	22.2	0	22.2	x	0.13	=	2.89			(30)
Total area of elements, m²			134.76							(31)
Party wall			6.5	x	0	=	0			(32)
Party floor			61.3							(32a)
Party ceiling			5							(32b)
Internal wall **			128.6							(32c)

TER WorkSheet: New dwelling design stage

** 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) =	38.26	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	4613.7	(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	6.74	(36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	45	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	26.22	26.09	25.96	25.34	25.22	24.68	24.68	24.58	24.89	25.22	25.46	25.7	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	71.23	71.09	70.96	70.34	70.22	69.68	69.68	69.58	69.89	70.22	70.46	70.7	

Average = Sum(39)$_{1...12}$ /12= 70.34 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.16	1.16	1.16	1.15	1.15	1.14	1.14	1.14	1.14	1.15	1.15	1.15	

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 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1	2.02	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 *Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)*	82.13	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m=	90.34	87.06	83.77	80.49	77.2	73.92	73.92	77.2	80.49	83.77	87.06	90.34	

Total = Sum(44)$_{1...12}$ = 985.57 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	133.98	117.18	120.92	105.42	101.15	87.29	80.88	92.81	93.92	109.46	119.48	129.75	

Total = Sum(45)$_{1...12}$ = 1292.24 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.1	17.58	18.14	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46	(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):	1.55	(48)
Temperature factor from Table 2b	0.54	(49)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	0.84	(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)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	183.22	161.65	170.16	153.07	150.39	134.94	130.13	142.06	141.58	158.7	167.14	178.99	(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=	183.22	161.65	170.16	153.07	150.39	134.94	130.13	142.06	141.58	158.7	167.14	178.99	

Output from water heater (annual)$_{1...12}$: 1872.03 (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=	83.94	74.54	79.6	73.17	73.03	67.15	66.29	70.25	69.35	75.79	77.85	82.54	(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=	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	100.91	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.73	13.97	11.36	8.6	6.43	5.43	5.87	7.62	10.23	12.99	15.16	16.17	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	176.21	178.04	173.43	163.62	151.24	139.6	131.83	130	134.61	144.42	156.8	168.44	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	33.09	(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=	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	(71)

TER WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=	112.82	110.93	106.99	101.63	98.15	93.26	89.1	94.43	96.32	101.87	108.13	110.94	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	361.04	359.21	348.05	330.13	312.1	294.56	283.06	288.32	297.44	315.55	336.36	351.81	(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	2.66	x	10.63	x	0.63	x	0.7	=	8.64	(74)
North	0.9x 0.77	x	1.06	x	10.63	x	0.63	x	0.7	=	3.44	(74)
North	0.9x 0.77	x	2.66	x	20.32	x	0.63	x	0.7	=	16.52	(74)
North	0.9x 0.77	x	1.06	x	20.32	x	0.63	x	0.7	=	6.58	(74)
North	0.9x 0.77	x	2.66	x	34.53	x	0.63	x	0.7	=	28.07	(74)
North	0.9x 0.77	x	1.06	x	34.53	x	0.63	x	0.7	=	11.19	(74)
North	0.9x 0.77	x	2.66	x	55.46	x	0.63	x	0.7	=	45.09	(74)
North	0.9x 0.77	x	1.06	x	55.46	x	0.63	x	0.7	=	17.97	(74)
North	0.9x 0.77	x	2.66	x	74.72	x	0.63	x	0.7	=	60.74	(74)
North	0.9x 0.77	x	1.06	x	74.72	x	0.63	x	0.7	=	24.2	(74)
North	0.9x 0.77	x	2.66	x	79.99	x	0.63	x	0.7	=	65.02	(74)
North	0.9x 0.77	x	1.06	x	79.99	x	0.63	x	0.7	=	25.91	(74)
North	0.9x 0.77	x	2.66	x	74.68	x	0.63	x	0.7	=	60.71	(74)
North	0.9x 0.77	x	1.06	x	74.68	x	0.63	x	0.7	=	24.19	(74)
North	0.9x 0.77	x	2.66	x	59.25	x	0.63	x	0.7	=	48.16	(74)
North	0.9x 0.77	x	1.06	x	59.25	x	0.63	x	0.7	=	19.19	(74)
North	0.9x 0.77	x	2.66	x	41.52	x	0.63	x	0.7	=	33.75	(74)
North	0.9x 0.77	x	1.06	x	41.52	x	0.63	x	0.7	=	13.45	(74)
North	0.9x 0.77	x	2.66	x	24.19	x	0.63	x	0.7	=	19.66	(74)
North	0.9x 0.77	x	1.06	x	24.19	x	0.63	x	0.7	=	7.84	(74)
North	0.9x 0.77	x	2.66	x	13.12	x	0.63	x	0.7	=	10.66	(74)
North	0.9x 0.77	x	1.06	x	13.12	x	0.63	x	0.7	=	4.25	(74)
North	0.9x 0.77	x	2.66	x	8.86	x	0.63	x	0.7	=	7.21	(74)
North	0.9x 0.77	x	1.06	x	8.86	x	0.63	x	0.7	=	2.87	(74)
East	0.9x 0.77	x	1.45	x	19.64	x	0.63	x	0.7	=	8.7	(76)
East	0.9x 0.77	x	1.45	x	38.42	x	0.63	x	0.7	=	17.03	(76)
East	0.9x 0.77	x	1.45	x	63.27	x	0.63	x	0.7	=	28.04	(76)
East	0.9x 0.77	x	1.45	x	92.28	x	0.63	x	0.7	=	40.89	(76)
East	0.9x 0.77	x	1.45	x	113.09	x	0.63	x	0.7	=	50.12	(76)
East	0.9x 0.77	x	1.45	x	115.77	x	0.63	x	0.7	=	51.3	(76)
East	0.9x 0.77	x	1.45	x	110.22	x	0.63	x	0.7	=	48.84	(76)
East	0.9x 0.77	x	1.45	x	94.68	x	0.63	x	0.7	=	41.95	(76)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.45	x	73.59	x	0.63	x	0.7	=	32.61	(76)
East	0.9x	0.77	x	1.45	x	45.59	x	0.63	x	0.7	=	20.2	(76)
East	0.9x	0.77	x	1.45	x	24.49	x	0.63	x	0.7	=	10.85	(76)
East	0.9x	0.77	x	1.45	x	16.15	x	0.63	x	0.7	=	7.16	(76)
South	0.9x	0.77	x	1.07	x	46.75	x	0.63	x	0.7	=	15.29	(78)
South	0.9x	0.77	x	1.75	x	46.75	x	0.63	x	0.7	=	25	(78)
South	0.9x	0.77	x	1.07	x	76.57	x	0.63	x	0.7	=	25.04	(78)
South	0.9x	0.77	x	1.75	x	76.57	x	0.63	x	0.7	=	40.95	(78)
South	0.9x	0.77	x	1.07	x	97.53	x	0.63	x	0.7	=	31.89	(78)
South	0.9x	0.77	x	1.75	x	97.53	x	0.63	x	0.7	=	52.16	(78)
South	0.9x	0.77	x	1.07	x	110.23	x	0.63	x	0.7	=	36.05	(78)
South	0.9x	0.77	x	1.75	x	110.23	x	0.63	x	0.7	=	58.96	(78)
South	0.9x	0.77	x	1.07	x	114.87	x	0.63	x	0.7	=	37.56	(78)
South	0.9x	0.77	x	1.75	x	114.87	x	0.63	x	0.7	=	61.44	(78)
South	0.9x	0.77	x	1.07	x	110.55	x	0.63	x	0.7	=	36.15	(78)
South	0.9x	0.77	x	1.75	x	110.55	x	0.63	x	0.7	=	59.12	(78)
South	0.9x	0.77	x	1.07	x	108.01	x	0.63	x	0.7	=	35.32	(78)
South	0.9x	0.77	x	1.75	x	108.01	x	0.63	x	0.7	=	57.77	(78)
South	0.9x	0.77	x	1.07	x	104.89	x	0.63	x	0.7	=	34.3	(78)
South	0.9x	0.77	x	1.75	x	104.89	x	0.63	x	0.7	=	56.1	(78)
South	0.9x	0.77	x	1.07	x	101.89	x	0.63	x	0.7	=	33.32	(78)
South	0.9x	0.77	x	1.75	x	101.89	x	0.63	x	0.7	=	54.49	(78)
South	0.9x	0.77	x	1.07	x	82.59	x	0.63	x	0.7	=	27.01	(78)
South	0.9x	0.77	x	1.75	x	82.59	x	0.63	x	0.7	=	44.17	(78)
South	0.9x	0.77	x	1.07	x	55.42	x	0.63	x	0.7	=	18.12	(78)
South	0.9x	0.77	x	1.75	x	55.42	x	0.63	x	0.7	=	29.64	(78)
South	0.9x	0.77	x	1.07	x	40.4	x	0.63	x	0.7	=	13.21	(78)
South	0.9x	0.77	x	1.75	x	40.4	x	0.63	x	0.7	=	21.61	(78)
West	0.9x	0.77	x	3.44	x	19.64	x	0.63	x	0.7	=	20.65	(80)
West	0.9x	0.77	x	1.78	x	19.64	x	0.63	x	0.7	=	10.68	(80)
West	0.9x	0.77	x	3.44	x	38.42	x	0.63	x	0.7	=	40.39	(80)
West	0.9x	0.77	x	1.78	x	38.42	x	0.63	x	0.7	=	20.9	(80)
West	0.9x	0.77	x	3.44	x	63.27	x	0.63	x	0.7	=	66.52	(80)
West	0.9x	0.77	x	1.78	x	63.27	x	0.63	x	0.7	=	34.42	(80)
West	0.9x	0.77	x	3.44	x	92.28	x	0.63	x	0.7	=	97.01	(80)
West	0.9x	0.77	x	1.78	x	92.28	x	0.63	x	0.7	=	50.2	(80)
West	0.9x	0.77	x	3.44	x	113.09	x	0.63	x	0.7	=	118.9	(80)
West	0.9x	0.77	x	1.78	x	113.09	x	0.63	x	0.7	=	61.52	(80)
West	0.9x	0.77	x	3.44	x	115.77	x	0.63	x	0.7	=	121.71	(80)
West	0.9x	0.77	x	1.78	x	115.77	x	0.63	x	0.7	=	62.98	(80)
West	0.9x	0.77	x	3.44	x	110.22	x	0.63	x	0.7	=	115.87	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.78	x	110.22	x	0.63	x	0.7	=	59.96		(80)
West	0.9x	0.77	x	3.44	x	94.68	x	0.63	x	0.7	=	99.53		(80)
West	0.9x	0.77	x	1.78	x	94.68	x	0.63	x	0.7	=	51.5		(80)
West	0.9x	0.77	x	3.44	x	73.59	x	0.63	x	0.7	=	77.37		(80)
West	0.9x	0.77	x	1.78	x	73.59	x	0.63	x	0.7	=	40.03		(80)
West	0.9x	0.77	x	3.44	x	45.59	x	0.63	x	0.7	=	47.93		(80)
West	0.9x	0.77	x	1.78	x	45.59	x	0.63	x	0.7	=	24.8		(80)
West	0.9x	0.77	x	3.44	x	24.49	x	0.63	x	0.7	=	25.75		(80)
West	0.9x	0.77	x	1.78	x	24.49	x	0.63	x	0.7	=	13.32		(80)
West	0.9x	0.77	x	3.44	x	16.15	x	0.63	x	0.7	=	16.98		(80)
West	0.9x	0.77	x	1.78	x	16.15	x	0.63	x	0.7	=	8.79		(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	92.42	167.41	252.29	346.17	414.47	422.2	402.66	350.75	285.01	191.61	112.59	77.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	453.46	526.62	600.35	676.3	726.57	716.76	685.72	639.07	582.45	507.15	448.96	429.63	(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	0.79	0.6	0.44	0.49	0.75	0.95	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.87	20.05	20.32	20.64	20.88	20.98	21	20.99	20.93	20.62	20.18	19.84	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.95	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.96	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.96	0.89	0.73	0.51	0.34	0.39	0.66	0.92	0.99	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.46	18.72	19.11	19.56	19.85	19.96	19.97	19.97	19.92	19.54	18.92	18.42	(90)

fLA = Living area ÷ (4) = 0.41 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.04	19.26	19.6	20	20.27	20.37	20.39	20.39	20.33	19.98	19.43	19	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.04	19.26	19.6	20	20.27	20.37	20.39	20.39	20.33	19.98	19.43	19	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.99	0.98	0.96	0.89	0.75	0.55	0.38	0.43	0.7	0.92	0.98	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	449.5	517.07	574.59	600.62	542.92	392.48	262.67	275.13	404.92	467.78	440.96	426.69	(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)

TER WorkSheet: New dwelling design stage

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1049.7	1020.82	929.65	780.97	601.7	402.19	263.96	277.41	435.33	658.49	869.01	1046.16	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	446.54	338.52	264.17	129.86	43.73	0	0	0	0	141.89	308.19	460.88	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2133.78 (98)

Space heating requirement in kWh/m²/year 34.81 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.5 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	446.54	338.52	264.17	129.86	43.73	0	0	0	0	141.89	308.19	460.88	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	477.59	362.05	282.53	138.88	46.77	0	0	0	0	151.75	329.62	492.92	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2282.11 (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)

	183.22	161.65	170.16	153.07	150.39	134.94	130.13	142.06	141.58	158.7	167.14	178.99	

Efficiency of water heater 79.8 (216)

(217)m=	87.1	86.74	85.98	84.38	81.98	79.8	79.8	79.8	79.8	84.52	86.43	87.23	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	210.35	186.36	197.9	181.41	183.44	169.1	163.06	178.02	177.42	187.77	193.39	205.2	

Total = Sum(219a)$_{1...12}$ = 2233.43 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2282.11
Water heating fuel used		2233.43
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		277.77 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4868.31 (338)

TER WorkSheet: New dwelling design stage

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	=	492.94	(261)	
Space heating (secondary)	(215) x	0.519	=	0	(263)	
Water heating	(219) x	0.216	=	482.42	(264)	
Space and water heating	(261) + (262) + (263) + (264) =			975.36	(265)	
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)	
Electricity for lighting	(232) x	0.519	=	144.16	(268)	
Total CO2, kg/year	sum of (265)…(271) =			1158.44	(272)	

TER = 27.65 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:48

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 51.9m²

Site Reference : 43LS **Plot Reference:** FLAT 17

Address : FLAT 17, 43 London Street, Reading, RG1 4PS

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	26.77 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.77 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.09 (max. 0.20)	0.09 (max. 0.35)	**OK**
Openings	0.92 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	6.93m²
Windows facing: South	1.71m²
Windows facing: North	2.1m²
Windows facing: West	2.81m²
Ventilation rate:	6.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Roofs U-value	0.09 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 17

Address : FLAT 17, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	51.9 (1a)	x	2.3 (2a)	=	119.37	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	51.9 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	119.37	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.93	x	1/[1/(0.92)+ 0.04]	=	6.15			(27)
Windows Type 2			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	45.31	13.55	31.76	x	0.16	=	5.08	14	444.64	(29)
Walls Type2	6.21	2.1	4.11	x	0.14	=	0.58	14	57.54	(29)
Roof	31	0	31	x	0.09	=	2.79	9	279	(30)
Total area of elements, m²			82.52							(31)
Party wall			21.16	x	0	=	0	20	423.2	(32)
Party floor			51.9					30	1557	(32a)
Party ceiling			20.9					20	418	(32b)
Internal wall **			95.68					9	861.12	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.26 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4040.5 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 77.85 (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 12.38 (36)

DER WorkSheet: New dwelling design stage

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.64 (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=	14.26	14.08	13.91	13.05	12.88	12.01	12.01	11.84	12.36	12.88	13.22	13.57	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	48.9	48.73	48.55	47.69	47.52	46.66	46.66	46.48	47	47.52	47.86	48.21	

Average = Sum(39)$_{1...12}$ /12= 47.65 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.94	0.94	0.94	0.92	0.92	0.9	0.9	0.9	0.91	0.92	0.92	0.93	

Average = Sum(40)$_{1...12}$ /12= 0.92 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.75 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 75.67 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	83.24	80.21	77.18	74.16	71.13	68.1	68.1	71.13	74.16	77.18	80.21	83.24	

Total = Sum(44)$_{1...12}$ = 908.04 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	123.44	107.96	111.41	97.13	93.19	80.42	74.52	85.51	86.53	100.85	110.08	119.54	

Total = Sum(45)$_{1...12}$ = 1190.59 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.52	16.19	16.71	14.57	13.98	12.06	11.18	12.83	12.98	15.13	16.51	17.93	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.45 (55)

DER WorkSheet: New dwelling design stage

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	137.5	120.66	125.47	110.73	107.26	94.03	88.58	99.58	100.14	114.91	123.69	133.61	(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=	137.5	120.66	125.47	110.73	107.26	94.03	88.58	99.58	100.14	114.91	123.69	133.61	

Output from water heater (annual)$_{1...12}$ | 1356.15 | (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=	41.04	35.9	37.04	32.29	30.99	26.74	24.78	28.43	28.77	33.53	36.6	39.75	(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=	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	13.57	12.05	9.8	7.42	5.55	4.68	5.06	6.58	8.83	11.21	13.08	13.94	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	152.17	153.75	149.77	141.3	130.6	120.55	113.84	112.26	116.24	124.71	135.4	145.45	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	(71)

Water heating gains (Table 5)

(72)m=	55.17	53.42	49.79	44.85	41.65	37.14	33.3	38.22	39.96	45.07	50.84	53.43	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	277.25	275.57	265.71	249.92	234.15	218.73	208.56	213.41	221.38	237.34	255.67	269.17	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x 0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x 0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x 0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x 0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x 0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x 0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x 0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x 0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x 0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x 0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
East	0.9x 0.77	x	6.93	x	19.64	x	0.51	x	0.8	=	38.48	(76)
East	0.9x 0.77	x	6.93	x	38.42	x	0.51	x	0.8	=	75.28	(76)
East	0.9x 0.77	x	6.93	x	63.27	x	0.51	x	0.8	=	123.98	(76)
East	0.9x 0.77	x	6.93	x	92.28	x	0.51	x	0.8	=	180.82	(76)
East	0.9x 0.77	x	6.93	x	113.09	x	0.51	x	0.8	=	221.6	(76)
East	0.9x 0.77	x	6.93	x	115.77	x	0.51	x	0.8	=	226.84	(76)
East	0.9x 0.77	x	6.93	x	110.22	x	0.51	x	0.8	=	215.96	(76)
East	0.9x 0.77	x	6.93	x	94.68	x	0.51	x	0.8	=	185.51	(76)
East	0.9x 0.77	x	6.93	x	73.59	x	0.51	x	0.8	=	144.19	(76)
East	0.9x 0.77	x	6.93	x	45.59	x	0.51	x	0.8	=	89.33	(76)
East	0.9x 0.77	x	6.93	x	24.49	x	0.51	x	0.8	=	47.98	(76)
East	0.9x 0.77	x	6.93	x	16.15	x	0.51	x	0.8	=	31.65	(76)
South	0.9x 0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x 0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x 0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x 0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x 0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)
South	0.9x 0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x 0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x 0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)
South	0.9x 0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x 0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x 0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x 0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)
West	0.9x 0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x 0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x 0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25	(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12	(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42	(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65	(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31	(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2	(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15	(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03	(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	86.61	161.33	251.45	353.27	426.7	435.37	414.99	359.66	287.28	187.16	106.39	72.32	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	363.86	436.9	517.16	603.19	660.85	654.1	623.54	573.06	508.66	424.5	362.07	341.49	(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=	0.92	0.89	0.82	0.7	0.57	0.42	0.32	0.35	0.55	0.77	0.89	0.93	(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=	20.53	20.53	20.53	20.54	20.54	20.55	20.55	20.55	20.55	20.54	20.54	20.54	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.92	0.88	0.81	0.69	0.55	0.4	0.29	0.32	0.52	0.76	0.88	0.93	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.53	20.53	20.53	20.54	20.54	20.55	20.55	20.55	20.55	20.54	20.54	20.54	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.76	20.77	20.77	20.77	20.77	20.78	20.78	20.78	20.77	20.77	20.77	20.77	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.76	20.77	20.77	20.77	20.77	20.78	20.78	20.78	20.77	20.77	20.77	20.77	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.92	0.88	0.81	0.7	0.56	0.41	0.3	0.34	0.53	0.77	0.89	0.93	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	335.4	385.34	420.42	420.2	367.34	268.02	188.25	194.43	271.99	324.85	321.68	317.99	(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=	805.09	773.06	692.68	566.13	431.07	288.14	194.83	203.44	313.69	483.34	654.29	798.72	(97)

DER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	349.45	260.54	202.56	105.07	47.41	0	0	0	0	117.92	239.48	357.67

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1680.1 (98)

Space heating requirement in kWh/m²/year 32.37 (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 1 501.51 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	349.45	260.54	202.56	105.07	47.41	0	0	0	0	117.92	239.48	357.67	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	69.68	51.95	40.39	20.95	9.45	0	0	0	0	23.51	47.75	71.32	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 335.01 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	137.5	120.66	125.47	110.73	107.26	94.03	88.58	99.58	100.14	114.91	123.69	133.61

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	70.81	62.14	64.61	57.03	55.24	48.42	45.62	51.28	51.57	59.18	63.7	68.8

Total = Sum(219a)$_{1...12}$ = 698.4 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		335.01
Water heating fuel used		698.4
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	132.89	(230a)
warm air heating system fans	71.62	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		204.51 (231)
Electricity for lighting		239.58 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1477.5 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

DER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	173.87	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	362.47	(264)
Space and water heating	(261) + (262) + (263) + (264) =				536.34	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	106.14	(267)
Electricity for lighting	(232) x		0.519	=	124.34	(268)
Total CO2, kg/year		sum of (265)…(271) =			766.82	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			14.77	(273)
EI rating (section 14)					89	(274)

Predicted Energy Assessment

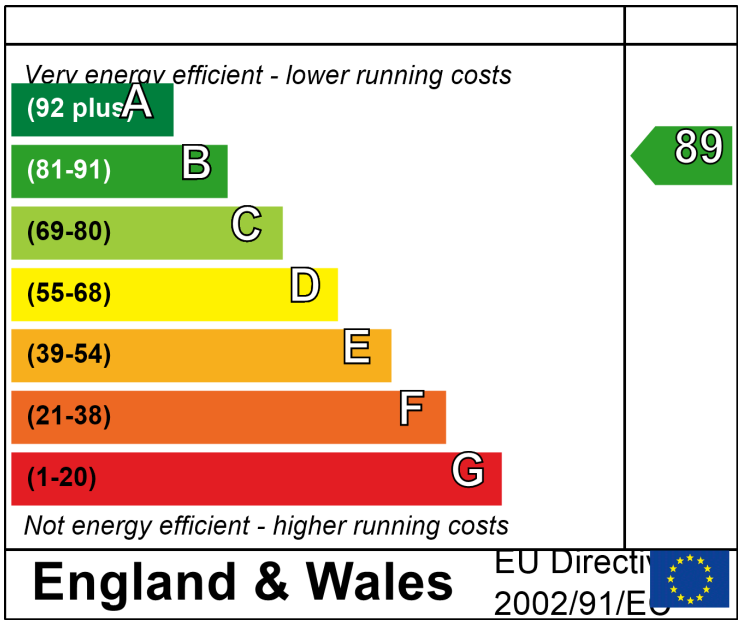
FLAT 17
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 51.9 m²

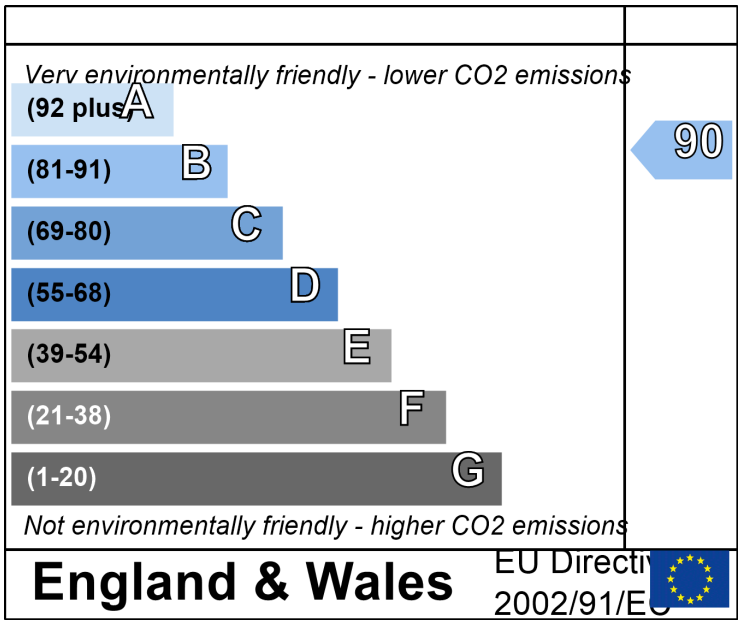
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 17

Address : FLAT 17, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	51.9 (1a)	x	2.3 (2a)	=	119.37	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	51.9 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	119.37	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34

(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=

0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.93	x	1/[1/(0.92)+ 0.04]	=	6.15			(27)
Windows Type 2			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Walls Type1	45.31	13.55	31.76	x	0.16	=	5.08	14	444.64	(29)
Walls Type2	6.21	2.1	4.11	x	0.14	=	0.58	14	57.54	(29)
Roof	31	0	31	x	0.09	=	2.79	9	279	(30)
Total area of elements, m²			82.52							(31)
Party wall			21.16	x	0	=	0	20	423.2	(32)
Party floor			51.9					30	1557	(32a)
Party ceiling			20.9					20	418	(32b)
Internal wall **			95.68					9	861.12	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.26 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4040.5 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 77.85 (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 12.38 (36)

SAP WorkSheet: New dwelling design stage

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.64 (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=	14.26	14.08	13.91	13.05	12.88	12.01	12.01	11.84	12.36	12.88	13.22	13.57	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	48.9	48.73	48.55	47.69	47.52	46.66	46.66	46.48	47	47.52	47.86	48.21	

Average = Sum(39)$_{1...12}$ /12= 47.65 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.94	0.94	0.94	0.92	0.92	0.9	0.9	0.9	0.91	0.92	0.92	0.93	

Average = Sum(40)$_{1...12}$ /12= 0.92 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.75 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 75.67 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	83.24	80.21	77.18	74.16	71.13	68.1	68.1	71.13	74.16	77.18	80.21	83.24	

Total = Sum(44)$_{1...12}$ = 908.04 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	123.44	107.96	111.41	97.13	93.19	80.42	74.52	85.51	86.53	100.85	110.08	119.54	

Total = Sum(45)$_{1...12}$ = 1190.59 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.52	16.19	16.71	14.57	13.98	12.06	11.18	12.83	12.98	15.13	16.51	17.93	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.45 (55)

SAP WorkSheet: New dwelling design stage

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	137.5	120.66	125.47	110.73	107.26	94.03	88.58	99.58	100.14	114.91	123.69	133.61	(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=	137.5	120.66	125.47	110.73	107.26	94.03	88.58	99.58	100.14	114.91	123.69	133.61	

Output from water heater (annual)$_{1...12}$ — 1356.15 — (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=	41.04	35.9	37.04	32.29	30.99	26.74	24.78	28.43	28.77	33.53	36.6	39.75	(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=	104.77	104.77	104.77	104.77	104.77	104.77	104.77	104.77	104.77	104.77	104.77	104.77	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	33.91	30.12	24.5	18.55	13.86	11.7	12.65	16.44	22.06	28.02	32.7	34.86	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	227.11	229.47	223.53	210.89	194.93	179.93	169.91	167.55	173.49	186.13	202.09	217.09	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	47.22	47.22	47.22	47.22	47.22	47.22	47.22	47.22	47.22	47.22	47.22	47.22	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	7.16	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	(71)

Water heating gains (Table 5)

(72)m=	55.17	53.42	49.79	44.85	41.65	37.14	33.3	38.22	39.96	45.07	50.84	53.43	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	405.5	402.32	387.12	363.6	339.75	318.08	305.17	311.51	324.82	348.53	374.94	394.68	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x 0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x 0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x 0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x 0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x 0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x 0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x 0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x 0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x 0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x 0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
East	0.9x 0.77	x	6.93	x	19.64	x	0.51	x	0.8	=	38.48	(76)
East	0.9x 0.77	x	6.93	x	38.42	x	0.51	x	0.8	=	75.28	(76)
East	0.9x 0.77	x	6.93	x	63.27	x	0.51	x	0.8	=	123.98	(76)
East	0.9x 0.77	x	6.93	x	92.28	x	0.51	x	0.8	=	180.82	(76)
East	0.9x 0.77	x	6.93	x	113.09	x	0.51	x	0.8	=	221.6	(76)
East	0.9x 0.77	x	6.93	x	115.77	x	0.51	x	0.8	=	226.84	(76)
East	0.9x 0.77	x	6.93	x	110.22	x	0.51	x	0.8	=	215.96	(76)
East	0.9x 0.77	x	6.93	x	94.68	x	0.51	x	0.8	=	185.51	(76)
East	0.9x 0.77	x	6.93	x	73.59	x	0.51	x	0.8	=	144.19	(76)
East	0.9x 0.77	x	6.93	x	45.59	x	0.51	x	0.8	=	89.33	(76)
East	0.9x 0.77	x	6.93	x	24.49	x	0.51	x	0.8	=	47.98	(76)
East	0.9x 0.77	x	6.93	x	16.15	x	0.51	x	0.8	=	31.65	(76)
South	0.9x 0.77	x	1.71	x	46.75	x	0.63	x	0.7	=	24.43	(78)
South	0.9x 0.77	x	1.71	x	76.57	x	0.63	x	0.7	=	40.01	(78)
South	0.9x 0.77	x	1.71	x	97.53	x	0.63	x	0.7	=	50.97	(78)
South	0.9x 0.77	x	1.71	x	110.23	x	0.63	x	0.7	=	57.61	(78)
South	0.9x 0.77	x	1.71	x	114.87	x	0.63	x	0.7	=	60.03	(78)
South	0.9x 0.77	x	1.71	x	110.55	x	0.63	x	0.7	=	57.77	(78)
South	0.9x 0.77	x	1.71	x	108.01	x	0.63	x	0.7	=	56.45	(78)
South	0.9x 0.77	x	1.71	x	104.89	x	0.63	x	0.7	=	54.82	(78)
South	0.9x 0.77	x	1.71	x	101.89	x	0.63	x	0.7	=	53.25	(78)
South	0.9x 0.77	x	1.71	x	82.59	x	0.63	x	0.7	=	43.16	(78)
South	0.9x 0.77	x	1.71	x	55.42	x	0.63	x	0.7	=	28.96	(78)
South	0.9x 0.77	x	1.71	x	40.4	x	0.63	x	0.7	=	21.11	(78)
West	0.9x 0.77	x	2.81	x	19.64	x	0.63	x	0.7	=	16.87	(80)
West	0.9x 0.77	x	2.81	x	38.42	x	0.63	x	0.7	=	32.99	(80)
West	0.9x 0.77	x	2.81	x	63.27	x	0.63	x	0.7	=	54.34	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.81	x	92.28	x	0.63	x	0.7	=	79.25		(80)
West	0.9x	0.77	x	2.81	x	113.09	x	0.63	x	0.7	=	97.12		(80)
West	0.9x	0.77	x	2.81	x	115.77	x	0.63	x	0.7	=	99.42		(80)
West	0.9x	0.77	x	2.81	x	110.22	x	0.63	x	0.7	=	94.65		(80)
West	0.9x	0.77	x	2.81	x	94.68	x	0.63	x	0.7	=	81.31		(80)
West	0.9x	0.77	x	2.81	x	73.59	x	0.63	x	0.7	=	63.2		(80)
West	0.9x	0.77	x	2.81	x	45.59	x	0.63	x	0.7	=	39.15		(80)
West	0.9x	0.77	x	2.81	x	24.49	x	0.63	x	0.7	=	21.03		(80)
West	0.9x	0.77	x	2.81	x	16.15	x	0.63	x	0.7	=	13.87		(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	86.61	161.33	251.45	353.27	426.7	435.37	414.99	359.66	287.28	187.16	106.39	72.32	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	492.11	563.65	638.57	716.86	766.45	753.45	720.16	671.17	612.1	535.69	481.33	467	(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=	0.87	0.82	0.75	0.64	0.51	0.37	0.28	0.31	0.48	0.69	0.82	0.88	(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=	20.53	20.53	20.53	20.54	20.54	20.55	20.55	20.55	20.55	20.54	20.54	20.54	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.86	0.82	0.74	0.62	0.49	0.35	0.25	0.28	0.45	0.67	0.81	0.87	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.53	20.53	20.53	20.54	20.54	20.55	20.55	20.55	20.55	20.54	20.54	20.54	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.76	20.77	20.77	20.77	20.77	20.78	20.78	20.78	20.77	20.77	20.77	20.77	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.76	20.77	20.77	20.77	20.77	20.78	20.78	20.78	20.77	20.77	20.77	20.77	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.86	0.82	0.75	0.63	0.5	0.36	0.26	0.29	0.46	0.68	0.82	0.88	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	425.3	461.78	476.46	452.12	381.92	273.1	190.06	197.06	283.96	365.5	394.24	409.09	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	805.09	773.06	692.68	566.13	431.07	288.14	194.83	203.44	313.69	483.34	654.29	798.72	(97)

SAP WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	282.57	209.18	160.87	82.08	36.57	0	0	0	0	87.67	187.24	289.88

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1336.05 (98)

Space heating requirement in kWh/m²/year 25.74 (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 1 501.51 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	282.57	209.18	160.87	82.08	36.57	0	0	0	0	87.67	187.24	289.88	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	56.34	41.71	32.08	16.37	7.29	0	0	0	0	17.48	37.33	57.8	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 266.41 (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)

	137.5	120.66	125.47	110.73	107.26	94.03	88.58	99.58	100.14	114.91	123.69	133.61

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	70.81	62.14	64.61	57.03	55.24	48.42	45.62	51.28	51.57	59.18	63.7	68.8

Total = Sum(219a)$_{1...12}$ = 698.4 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		266.41
Water heating fuel used		698.4
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	132.89	(230a)
warm air heating system fans	71.62	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		204.51 (231)
Electricity for lighting		239.58 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1408.89 (338)

10a. Fuel costs - individual heating systems:

SAP WorkSheet: New dwelling design stage

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		13.19	x 0.01 =	35.14	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	92.12	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	26.97	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	31.6	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				185.83	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.81	(257)
SAP rating (Section 12)	88.76	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	138.27	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	362.47	(264)
Space and water heating	(261) + (262) + (263) + (264) =				500.73	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	106.14	(267)
Electricity for lighting	(232) x		0.519	=	124.34	(268)
Total CO2, kg/year		sum of (265)...(271) =			731.22	(272)
CO2 emissions per m²		(272) ÷ (4) =			14.09	(273)
EI rating (section 14)					90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		3.07	=	817.87	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2144.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2961.96	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	627.85	(267)

SAP WorkSheet: New dwelling design stage

Electricity for lighting	(232)	x	0	=	735.5 (268)
'Total Primary Energy			sum of (265)…(271) =		4325.3 (272)
Primary energy kWh/m²/year			(272) ÷ (4) =		83.34 (273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 17

Address : FLAT 17, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	51.9 (1a)	x	2.3 (2a)	=	119.37	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	51.9 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	119.37	(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) =	0.17	(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)			0.42	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.29	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.37	0.37	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34

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=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			5.56	x1/[1/(1.4)+ 0.04]		=	7.37			(27)
Windows Type 2			1.37	x1/[1/(1.4)+ 0.04]		=	1.82			(27)
Windows Type 3			1.69	x1/[1/(1.4)+ 0.04]		=	2.24			(27)
Windows Type 4			2.26	x1/[1/(1.4)+ 0.04]		=	3			(27)
Walls Type1	45.31	10.88	34.43	x	0.18	=	6.2			(29)
Walls Type2	6.21	2.1	4.11	x	0.18	=	0.74			(29)
Roof	31	0	31	x	0.13	=	4.03			(30)
Total area of elements, m²			82.52							(31)
Party wall			21.16	x	0	=	0			(32)
Party floor			51.9							(32a)
Party ceiling			20.9							(32b)
Internal wall **			95.68							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 27.49 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4077.88 (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)

TER WorkSheet: New dwelling design stage

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.62 (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=	22.43	22.33	22.22	21.73	21.64	21.21	21.21	21.14	21.38	21.64	21.83	22.02	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	54.05	53.94	53.84	53.35	53.26	52.83	52.83	52.75	53	53.26	53.44	53.64	

Average = Sum(39)$_{1...12}$ /12= 53.35 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.04	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.03	1.03	1.03	

Average = Sum(40)$_{1...12}$ /12= 1.03 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.75 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 75.67 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	83.24	80.21	77.18	74.16	71.13	68.1	68.1	71.13	74.16	77.18	80.21	83.24	

Total = Sum(44)$_{1...12}$ = 908.04 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	123.44	107.96	111.41	97.13	93.19	80.42	74.52	85.51	86.53	100.85	110.08	119.54	

Total = Sum(45)$_{1...12}$ = 1190.59 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.52	16.19	16.71	14.57	13.98	12.06	11.18	12.83	12.98	15.13	16.51	17.93	(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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (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) 0.84 (55)

TER WorkSheet: New dwelling design stage

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	172.68	152.44	160.65	144.78	142.44	128.07	123.76	134.76	134.19	150.09	157.74	168.79	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	172.68	152.44	160.65	144.78	142.44	128.07	123.76	134.76	134.19	150.09	157.74	168.79	

Output from water heater (annual)$_{1...12}$ | 1770.38 | (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=	80.44	71.48	76.44	70.42	70.38	64.86	64.17	67.83	66.9	72.93	74.73	79.14	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	87.31	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	13.6	12.08	9.83	7.44	5.56	4.7	5.07	6.59	8.85	11.24	13.12	13.98	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	152.17	153.75	149.77	141.3	130.6	120.55	113.84	112.26	116.24	124.71	135.4	145.45	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	31.73	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	-69.84	(71)

Water heating gains (Table 5)

(72)m=	108.11	106.37	102.74	97.8	94.6	90.09	86.25	91.17	92.91	98.02	103.79	106.37	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	326.08	324.39	314.52	298.73	282.95	267.53	257.36	262.21	270.19	286.16	304.5	318	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	1.69	x	10.63	x	0.63	x	0.7	=	5.49	(74)
North	0.9x 0.77	x	1.69	x	20.32	x	0.63	x	0.7	=	10.5	(74)
North	0.9x 0.77	x	1.69	x	34.53	x	0.63	x	0.7	=	17.83	(74)
North	0.9x 0.77	x	1.69	x	55.46	x	0.63	x	0.7	=	28.65	(74)
North	0.9x 0.77	x	1.69	x	74.72	x	0.63	x	0.7	=	38.59	(74)
North	0.9x 0.77	x	1.69	x	79.99	x	0.63	x	0.7	=	41.31	(74)
North	0.9x 0.77	x	1.69	x	74.68	x	0.63	x	0.7	=	38.57	(74)
North	0.9x 0.77	x	1.69	x	59.25	x	0.63	x	0.7	=	30.6	(74)
North	0.9x 0.77	x	1.69	x	41.52	x	0.63	x	0.7	=	21.44	(74)
North	0.9x 0.77	x	1.69	x	24.19	x	0.63	x	0.7	=	12.49	(74)
North	0.9x 0.77	x	1.69	x	13.12	x	0.63	x	0.7	=	6.78	(74)
North	0.9x 0.77	x	1.69	x	8.86	x	0.63	x	0.7	=	4.58	(74)
East	0.9x 0.77	x	5.56	x	19.64	x	0.63	x	0.7	=	33.37	(76)
East	0.9x 0.77	x	5.56	x	38.42	x	0.63	x	0.7	=	65.28	(76)
East	0.9x 0.77	x	5.56	x	63.27	x	0.63	x	0.7	=	107.51	(76)
East	0.9x 0.77	x	5.56	x	92.28	x	0.63	x	0.7	=	156.8	(76)
East	0.9x 0.77	x	5.56	x	113.09	x	0.63	x	0.7	=	192.17	(76)
East	0.9x 0.77	x	5.56	x	115.77	x	0.63	x	0.7	=	196.72	(76)
East	0.9x 0.77	x	5.56	x	110.22	x	0.63	x	0.7	=	187.28	(76)
East	0.9x 0.77	x	5.56	x	94.68	x	0.63	x	0.7	=	160.87	(76)
East	0.9x 0.77	x	5.56	x	73.59	x	0.63	x	0.7	=	125.04	(76)
East	0.9x 0.77	x	5.56	x	45.59	x	0.63	x	0.7	=	77.47	(76)
East	0.9x 0.77	x	5.56	x	24.49	x	0.63	x	0.7	=	41.61	(76)
East	0.9x 0.77	x	5.56	x	16.15	x	0.63	x	0.7	=	27.44	(76)
South	0.9x 0.77	x	1.37	x	46.75	x	0.63	x	0.7	=	19.57	(78)
South	0.9x 0.77	x	1.37	x	76.57	x	0.63	x	0.7	=	32.06	(78)
South	0.9x 0.77	x	1.37	x	97.53	x	0.63	x	0.7	=	40.84	(78)
South	0.9x 0.77	x	1.37	x	110.23	x	0.63	x	0.7	=	46.15	(78)
South	0.9x 0.77	x	1.37	x	114.87	x	0.63	x	0.7	=	48.1	(78)
South	0.9x 0.77	x	1.37	x	110.55	x	0.63	x	0.7	=	46.29	(78)
South	0.9x 0.77	x	1.37	x	108.01	x	0.63	x	0.7	=	45.22	(78)
South	0.9x 0.77	x	1.37	x	104.89	x	0.63	x	0.7	=	43.92	(78)
South	0.9x 0.77	x	1.37	x	101.89	x	0.63	x	0.7	=	42.66	(78)
South	0.9x 0.77	x	1.37	x	82.59	x	0.63	x	0.7	=	34.58	(78)
South	0.9x 0.77	x	1.37	x	55.42	x	0.63	x	0.7	=	23.2	(78)
South	0.9x 0.77	x	1.37	x	40.4	x	0.63	x	0.7	=	16.91	(78)
West	0.9x 0.77	x	2.26	x	19.64	x	0.63	x	0.7	=	13.57	(80)
West	0.9x 0.77	x	2.26	x	38.42	x	0.63	x	0.7	=	26.54	(80)
West	0.9x 0.77	x	2.26	x	63.27	x	0.63	x	0.7	=	43.7	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.26	x	92.28	x	0.63	x	0.7	=	63.74	(80)
West	0.9x	0.77	x	2.26	x	113.09	x	0.63	x	0.7	=	78.11	(80)
West	0.9x	0.77	x	2.26	x	115.77	x	0.63	x	0.7	=	79.96	(80)
West	0.9x	0.77	x	2.26	x	110.22	x	0.63	x	0.7	=	76.13	(80)
West	0.9x	0.77	x	2.26	x	94.68	x	0.63	x	0.7	=	65.39	(80)
West	0.9x	0.77	x	2.26	x	73.59	x	0.63	x	0.7	=	50.83	(80)
West	0.9x	0.77	x	2.26	x	45.59	x	0.63	x	0.7	=	31.49	(80)
West	0.9x	0.77	x	2.26	x	24.49	x	0.63	x	0.7	=	16.91	(80)
West	0.9x	0.77	x	2.26	x	16.15	x	0.63	x	0.7	=	11.16	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	72	134.37	209.89	295.34	356.96	364.28	347.2	300.78	239.97	156.02	88.5	60.09	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	398.08	458.76	524.41	594.07	639.92	631.8	604.56	562.99	510.16	442.18	393	378.09	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.96	0.88	0.72	0.53	0.38	0.43	0.68	0.92	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.06	20.23	20.49	20.77	20.94	20.99	21	21	20.97	20.73	20.34	20.03	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.05	20.05	20.05	20.06	20.06	20.07	20.07	20.07	20.07	20.06	20.06	20.06	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.85	0.66	0.45	0.3	0.34	0.6	0.9	0.98	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.81	19.06	19.42	19.81	20.01	20.06	20.07	20.07	20.04	19.77	19.23	18.77	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.44	19.65	19.96	20.29	20.47	20.53	20.53	20.53	20.5	20.25	19.79	19.4	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.44	19.65	19.96	20.29	20.47	20.53	20.53	20.53	20.5	20.25	19.79	19.4	(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	0.49	0.34	0.39	0.64	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	394	448.83	496.12	508.36	441.66	309.92	207.49	217.4	326.61	399.04	384.5	375.07	(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=	818.32	795.39	724.45	607.76	467.24	313.17	207.85	218.09	339.42	514.01	677.93	815.32	(97)

TER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	315.69	232.89	169.87	71.57	19.03	0	0	0	0	85.54	211.27	327.55

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1433.41 (98)

Space heating requirement in kWh/m²/year 27.62 (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)	315.69	232.89	169.87	71.57	19.03	0	0	0	0	85.54	211.27	327.55	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	337.64	249.08	181.68	76.55	20.35	0	0	0	0	91.48	225.96	350.32	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1533.06 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	172.68	152.44	160.65	144.78	142.44	128.07	123.76	134.76	134.19	150.09	157.74	168.79

Efficiency of water heater 79.8 (216)

(217)m=	86.4	85.94	84.96	83.05	80.93	79.8	79.8	79.8	79.8	83.38	85.59	86.55

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	199.85	177.37	189.08	174.33	176.01	160.49	155.09	168.87	168.16	180.01	184.29	195.01

Total = Sum(219a)$_{1...12}$ = 2128.56 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1533.06
Water heating fuel used		2128.56
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75 (231)
Electricity for lighting		240.26 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3976.89 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

TER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	331.14	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	459.77	(264)
Space and water heating	(261) + (262) + (263) + (264) =				790.91	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	124.7	(268)
Total CO2, kg/year		sum of (265)…(271) =			954.53	(272)
TER =					26.77	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:45

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76m²

Site Reference : 43LS **Plot Reference:** FLAT 18

Address : FLAT 18, 43 London Street, Reading, RG1 4PS

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity
Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)	30.28 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.46 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	64.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.22 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	**OK**
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	**OK**
Openings	0.95 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.76	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	6.67m²
Windows facing: East	7.82m²
Windows facing: North	5.98m²
Windows facing: North	2.1m²
Windows facing: South	2.1m²
Windows facing: North	5.62m²
Windows facing: West	2.1m²
Ventilation rate:	3.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Roofs U-value	0.12 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 18

Address : FLAT 18, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76 (1a)	x	2.3 (2a)	=	174.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	174.8	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.89	x	0.33	=	0.6237			(26)
Windows Type 1			6.67	x	1/[1/(0.92)+ 0.04]	=	5.92			(27)
Windows Type 2			7.82	x	1/[1/(0.92)+ 0.04]	=	6.94			(27)
Windows Type 3			5.98	x	1/[1/(0.92)+ 0.04]	=	5.31			(27)
Windows Type 4			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 5			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 6			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Windows Type 7			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Floor			76	x	0.13	=	9.879999	110	8360	(28)
Walls Type1	58.88	32.39	26.49	x	0.16	=	4.24	14	370.86	(29)
Walls Type2	5.75	0	5.75	x	0.14	=	0.81	9	51.75	(29)
Walls Type3	10.81	1.89	8.92	x	0.14	=	1.25	14	124.88	(29)
Walls Type4	8.74	0	8.74	x	0.22	=	1.92	14	122.36	(29)
Roof	29	0	29	x	0.12	=	3.48	9	261	(30)
Total area of elements, m²			189.18							(31)
Party wall			16.56	x	0	=	0	20	331.2	(32)
Party ceiling			47					20	940	(32b)
Internal wall **			143.52					9	1291.68	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 52.92 (33)

DER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11853.73 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 155.97 (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 18.51 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 71.43 (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=	20.63	20.38	20.12	18.86	18.61	17.35	17.35	17.1	17.85	18.61	19.12	19.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	92.06	91.8	91.55	90.29	90.04	88.78	88.78	88.52	89.28	90.04	90.54	91.05	

Average = Sum(39)$_{1...12}$ /12= 90.23 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.21	1.21	1.2	1.19	1.18	1.17	1.17	1.16	1.17	1.18	1.19	1.2	

Average = Sum(40)$_{1...12}$ /12= 1.19 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.38 (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 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

DER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	162.16	142.23	147.72	130.14	125.87	110.09	103.47	116.66	117.43	135.06	145.68	157.49	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	162.16	142.23	147.72	130.14	125.87	110.09	103.47	116.66	117.43	135.06	145.68	157.49	

Output from water heater (annual)$_{1...12}$ 1593.99 (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=	49.24	43.07	44.44	38.75	37.18	32.08	29.73	34.11	34.52	40.23	43.91	47.69	(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=	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	(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=	66.19	64.09	59.73	53.81	49.97	44.56	39.96	45.85	47.95	54.07	60.99	64.1	(72)

DER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	365.09	363.08	350.09	329.13	307.88	287.34	273.96	279.76	290.49	311.66	335.99	354.22	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.98	x	10.63	x	0.51	x	0.8	=	17.98	(74)
North	0.9x 0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x 0.77	x	2.81	x	10.63	x	0.63	x	0.7	=	18.26	(74)
North	0.9x 0.77	x	5.98	x	20.32	x	0.51	x	0.8	=	34.36	(74)
North	0.9x 0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x 0.77	x	2.81	x	20.32	x	0.63	x	0.7	=	34.9	(74)
North	0.9x 0.77	x	5.98	x	34.53	x	0.51	x	0.8	=	58.38	(74)
North	0.9x 0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x 0.77	x	2.81	x	34.53	x	0.63	x	0.7	=	59.31	(74)
North	0.9x 0.77	x	5.98	x	55.46	x	0.51	x	0.8	=	93.78	(74)
North	0.9x 0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x 0.77	x	2.81	x	55.46	x	0.63	x	0.7	=	95.26	(74)
North	0.9x 0.77	x	5.98	x	74.72	x	0.51	x	0.8	=	126.33	(74)
North	0.9x 0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x 0.77	x	2.81	x	74.72	x	0.63	x	0.7	=	128.33	(74)
North	0.9x 0.77	x	5.98	x	79.99	x	0.51	x	0.8	=	135.24	(74)
North	0.9x 0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x 0.77	x	2.81	x	79.99	x	0.63	x	0.7	=	137.38	(74)
North	0.9x 0.77	x	5.98	x	74.68	x	0.51	x	0.8	=	126.26	(74)
North	0.9x 0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x 0.77	x	2.81	x	74.68	x	0.63	x	0.7	=	128.26	(74)
North	0.9x 0.77	x	5.98	x	59.25	x	0.51	x	0.8	=	100.17	(74)
North	0.9x 0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x 0.77	x	2.81	x	59.25	x	0.63	x	0.7	=	101.76	(74)
North	0.9x 0.77	x	5.98	x	41.52	x	0.51	x	0.8	=	70.2	(74)
North	0.9x 0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	2.81	x	41.52	x	0.63	x	0.7	=	71.31	(74)
North	0.9x 0.77	x	5.98	x	24.19	x	0.51	x	0.8	=	40.9	(74)
North	0.9x 0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x 0.77	x	2.81	x	24.19	x	0.63	x	0.7	=	41.55	(74)
North	0.9x 0.77	x	5.98	x	13.12	x	0.51	x	0.8	=	22.18	(74)
North	0.9x 0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x 0.77	x	2.81	x	13.12	x	0.63	x	0.7	=	22.53	(74)
North	0.9x 0.77	x	5.98	x	8.86	x	0.51	x	0.8	=	14.99	(74)

DER WorkSheet: New dwelling design stage

North	0.9x	0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
North	0.9x	0.77	x	2.81	x	8.86	x	0.63	x	0.7	=	15.23	(74)
East	0.9x	0.77	x	6.67	x	19.64	x	0.51	x	0.8	=	37.04	(76)
East	0.9x	0.77	x	7.82	x	19.64	x	0.51	x	0.8	=	43.43	(76)
East	0.9x	0.77	x	6.67	x	38.42	x	0.51	x	0.8	=	72.46	(76)
East	0.9x	0.77	x	7.82	x	38.42	x	0.51	x	0.8	=	84.95	(76)
East	0.9x	0.77	x	6.67	x	63.27	x	0.51	x	0.8	=	119.33	(76)
East	0.9x	0.77	x	7.82	x	63.27	x	0.51	x	0.8	=	139.9	(76)
East	0.9x	0.77	x	6.67	x	92.28	x	0.51	x	0.8	=	174.03	(76)
East	0.9x	0.77	x	7.82	x	92.28	x	0.51	x	0.8	=	204.04	(76)
East	0.9x	0.77	x	6.67	x	113.09	x	0.51	x	0.8	=	213.28	(76)
East	0.9x	0.77	x	7.82	x	113.09	x	0.51	x	0.8	=	250.05	(76)
East	0.9x	0.77	x	6.67	x	115.77	x	0.51	x	0.8	=	218.33	(76)
East	0.9x	0.77	x	7.82	x	115.77	x	0.51	x	0.8	=	255.98	(76)
East	0.9x	0.77	x	6.67	x	110.22	x	0.51	x	0.8	=	207.86	(76)
East	0.9x	0.77	x	7.82	x	110.22	x	0.51	x	0.8	=	243.7	(76)
East	0.9x	0.77	x	6.67	x	94.68	x	0.51	x	0.8	=	178.55	(76)
East	0.9x	0.77	x	7.82	x	94.68	x	0.51	x	0.8	=	209.33	(76)
East	0.9x	0.77	x	6.67	x	73.59	x	0.51	x	0.8	=	138.78	(76)
East	0.9x	0.77	x	7.82	x	73.59	x	0.51	x	0.8	=	162.71	(76)
East	0.9x	0.77	x	6.67	x	45.59	x	0.51	x	0.8	=	85.98	(76)
East	0.9x	0.77	x	7.82	x	45.59	x	0.51	x	0.8	=	100.8	(76)
East	0.9x	0.77	x	6.67	x	24.49	x	0.51	x	0.8	=	46.18	(76)
East	0.9x	0.77	x	7.82	x	24.49	x	0.51	x	0.8	=	54.15	(76)
East	0.9x	0.77	x	6.67	x	16.15	x	0.51	x	0.8	=	30.46	(76)
East	0.9x	0.77	x	7.82	x	16.15	x	0.51	x	0.8	=	35.71	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
West	0.9x	0.77	x	2.1	x	19.64	x	0.63	x	0.7	=	12.6	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.63	x	0.7	=	24.66	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.63	x	0.7	=	40.61	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.1	x	92.28	x	0.63	x	0.7	=	59.22	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.63	x	0.7	=	72.58	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.63	x	0.7	=	74.3	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.63	x	0.7	=	70.74	(80)
West	0.9x	0.77	x	2.1	x	94.68	x	0.63	x	0.7	=	60.76	(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.63	x	0.7	=	47.23	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.63	x	0.7	=	29.26	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.63	x	0.7	=	15.72	(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.63	x	0.7	=	10.37	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	166.14	313.51	502.28	732.68	912.25	943.51	894.07	755.92	582.26	367.01	204.74	138.37	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	531.23	676.59	852.38	1061.81	1220.12	1230.85	1168.02	1035.68	872.75	678.67	540.73	492.59	(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=	0.98	0.96	0.91	0.79	0.61	0.44	0.33	0.38	0.63	0.88	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	21	21	21	21	21	21	21	21	21	21	21	21	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.39	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=	0.98	0.96	0.9	0.77	0.58	0.41	0.29	0.34	0.59	0.86	0.96	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.39	20.4	20.4	20.41	20.41	20.42	20.42	20.42	20.41	20.41	20.4	20.4	(90)

fLA = Living area ÷ (4) = 0.36 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.61	20.61	20.61	20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.61	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.61	20.61	20.61	20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.61	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.96	0.9	0.77	0.59	0.42	0.3	0.35	0.6	0.87	0.97	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	520.93	647.98	768.28	820.68	725.77	517.6	353.12	367	525.03	590.55	521.81	485.04	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1501.41	1442.31	1291.95	1057.93	802.97	534.74	357.19	373.97	582.23	902.01	1223.77	1494.44	(97)

DER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	729.48	533.79	389.61	170.82	57.44	0	0	0	0	231.73	505.41	750.99

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3369.27 (98)

Space heating requirement in kWh/m²/year 44.33 (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 1 512.62 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	729.48	533.79	389.61	170.82	57.44	0	0	0	0	231.73	505.41	750.99	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	142.3	104.13	76	33.32	11.2	0	0	0	0	45.2	98.59	146.5	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 657.26 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	162.16	142.23	147.72	130.14	125.87	110.09	103.47	116.66	117.43	135.06	145.68	157.49

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	83.51	73.25	76.07	67.02	64.82	56.7	53.28	60.08	60.47	69.55	75.02	81.1

Total = Sum(219a)$_{1...12}$ = 820.88 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		657.26
Water heating fuel used		820.88
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	202.59	(230a)
warm air heating system fans	104.88	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		307.47 (231)
Electricity for lighting		332.01 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2117.63 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

DER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	341.12	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	426.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =				767.16	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	159.58	(267)
Electricity for lighting	(232) x		0.519	=	172.31	(268)
Total CO2, kg/year		sum of (265)…(271) =			1099.05	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			14.46	(273)
EI rating (section 14)					88	(274)

Predicted Energy Assessment

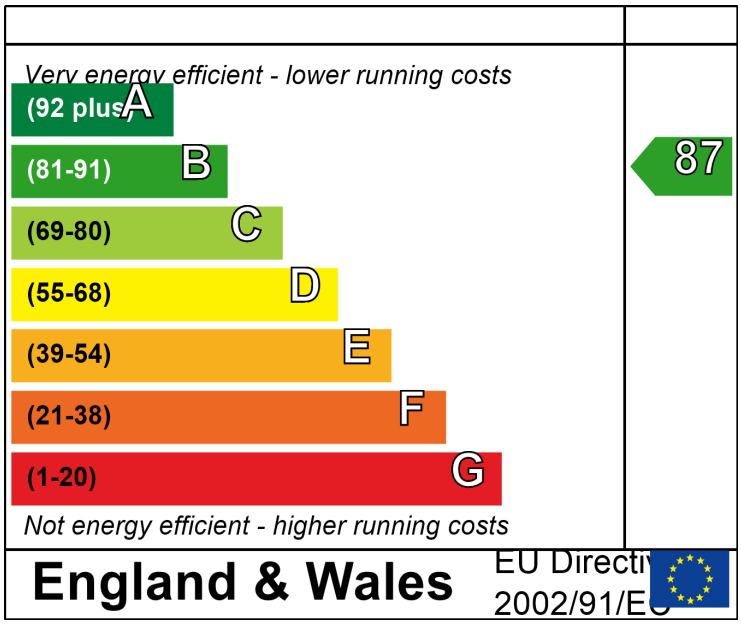
FLAT 18
43 London Street
Reading
RG1 4PS

Dwelling type: Ground floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 76 m²

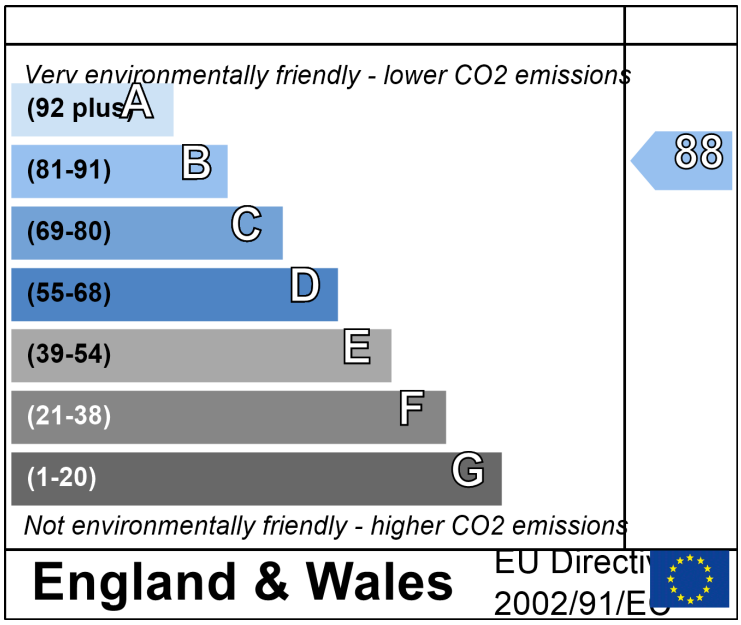
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 18

Address : FLAT 18, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76 (1a)	x	2.3 (2a)	=	174.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	174.8	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(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=	0.36	0.35	0.35	0.33	0.32	0.3	0.3	0.3	0.31	0.32	0.33	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.89	x	0.33	=	0.6237			(26)
Windows Type 1			6.67	x	1/[1/(0.92)+ 0.04]	=	5.92			(27)
Windows Type 2			7.82	x	1/[1/(0.92)+ 0.04]	=	6.94			(27)
Windows Type 3			5.98	x	1/[1/(0.92)+ 0.04]	=	5.31			(27)
Windows Type 4			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 5			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 6			2.81	x	1/[1/(1.1)+ 0.04]	=	2.96			(27)
Windows Type 7			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Floor			76	x	0.13	=	9.879999	110	8360	(28)
Walls Type1	58.88	32.39	26.49	x	0.16	=	4.24	14	370.86	(29)
Walls Type2	5.75	0	5.75	x	0.14	=	0.81	9	51.75	(29)
Walls Type3	10.81	1.89	8.92	x	0.14	=	1.25	14	124.88	(29)
Walls Type4	8.74	0	8.74	x	0.22	=	1.92	14	122.36	(29)
Roof	29	0	29	x	0.12	=	3.48	9	261	(30)
Total area of elements, m²			189.18							(31)
Party wall			16.56	x	0	=	0	20	331.2	(32)
Party ceiling			47					20	940	(32b)
Internal wall **			143.52					9	1291.68	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 52.92 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11853.73 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 155.97 (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 18.51 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 71.43 (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=	20.63	20.38	20.12	18.86	18.61	17.35	17.35	17.1	17.85	18.61	19.12	19.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	92.06	91.8	91.55	90.29	90.04	88.78	88.78	88.52	89.28	90.04	90.54	91.05	

Average = Sum(39)$_{1...12}$ /12= 90.23 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.21	1.21	1.2	1.19	1.18	1.17	1.17	1.16	1.17	1.18	1.19	1.2	

Average = Sum(40)$_{1...12}$ /12= 1.19 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.38 (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 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

SAP WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3: 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	162.16	142.23	147.72	130.14	125.87	110.09	103.47	116.66	117.43	135.06	145.68	157.49	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	162.16	142.23	147.72	130.14	125.87	110.09	103.47	116.66	117.43	135.06	145.68	157.49	

Output from water heater (annual)$_{1...12}$ 1593.99 (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=	49.24	43.07	44.44	38.75	37.18	32.08	29.73	34.11	34.52	40.23	43.91	47.69	(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=	142.96	142.96	142.96	142.96	142.96	142.96	142.96	142.96	142.96	142.96	142.96	142.96	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	47	41.74	33.95	25.7	19.21	16.22	17.53	22.78	30.58	38.82	45.31	48.31	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	314.74	318.01	309.78	292.26	270.14	249.35	235.47	232.2	240.43	257.95	280.07	300.86	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.68	51.68	51.68	51.68	51.68	51.68	51.68	51.68	51.68	51.68	51.68	51.68	(69)

Pumps and fans gains (Table 5a)

(70)m=	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	10.49	(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=	66.19	64.09	59.73	53.81	49.97	44.56	39.96	45.85	47.95	54.07	60.99	64.1	(72)

SAP WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	537.75	533.66	513.28	481.59	449.14	419.95	402.77	410.65	428.77	460.67	496.19	523.08	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.98	x	10.63	x	0.51	x	0.8	=	17.98	(74)
North	0.9x 0.77	x	2.1	x	10.63	x	0.63	x	0.7	=	6.82	(74)
North	0.9x 0.77	x	2.81	x	10.63	x	0.63	x	0.7	=	18.26	(74)
North	0.9x 0.77	x	5.98	x	20.32	x	0.51	x	0.8	=	34.36	(74)
North	0.9x 0.77	x	2.1	x	20.32	x	0.63	x	0.7	=	13.04	(74)
North	0.9x 0.77	x	2.81	x	20.32	x	0.63	x	0.7	=	34.9	(74)
North	0.9x 0.77	x	5.98	x	34.53	x	0.51	x	0.8	=	58.38	(74)
North	0.9x 0.77	x	2.1	x	34.53	x	0.63	x	0.7	=	22.16	(74)
North	0.9x 0.77	x	2.81	x	34.53	x	0.63	x	0.7	=	59.31	(74)
North	0.9x 0.77	x	5.98	x	55.46	x	0.51	x	0.8	=	93.78	(74)
North	0.9x 0.77	x	2.1	x	55.46	x	0.63	x	0.7	=	35.6	(74)
North	0.9x 0.77	x	2.81	x	55.46	x	0.63	x	0.7	=	95.26	(74)
North	0.9x 0.77	x	5.98	x	74.72	x	0.51	x	0.8	=	126.33	(74)
North	0.9x 0.77	x	2.1	x	74.72	x	0.63	x	0.7	=	47.95	(74)
North	0.9x 0.77	x	2.81	x	74.72	x	0.63	x	0.7	=	128.33	(74)
North	0.9x 0.77	x	5.98	x	79.99	x	0.51	x	0.8	=	135.24	(74)
North	0.9x 0.77	x	2.1	x	79.99	x	0.63	x	0.7	=	51.33	(74)
North	0.9x 0.77	x	2.81	x	79.99	x	0.63	x	0.7	=	137.38	(74)
North	0.9x 0.77	x	5.98	x	74.68	x	0.51	x	0.8	=	126.26	(74)
North	0.9x 0.77	x	2.1	x	74.68	x	0.63	x	0.7	=	47.93	(74)
North	0.9x 0.77	x	2.81	x	74.68	x	0.63	x	0.7	=	128.26	(74)
North	0.9x 0.77	x	5.98	x	59.25	x	0.51	x	0.8	=	100.17	(74)
North	0.9x 0.77	x	2.1	x	59.25	x	0.63	x	0.7	=	38.02	(74)
North	0.9x 0.77	x	2.81	x	59.25	x	0.63	x	0.7	=	101.76	(74)
North	0.9x 0.77	x	5.98	x	41.52	x	0.51	x	0.8	=	70.2	(74)
North	0.9x 0.77	x	2.1	x	41.52	x	0.63	x	0.7	=	26.64	(74)
North	0.9x 0.77	x	2.81	x	41.52	x	0.63	x	0.7	=	71.31	(74)
North	0.9x 0.77	x	5.98	x	24.19	x	0.51	x	0.8	=	40.9	(74)
North	0.9x 0.77	x	2.1	x	24.19	x	0.63	x	0.7	=	15.52	(74)
North	0.9x 0.77	x	2.81	x	24.19	x	0.63	x	0.7	=	41.55	(74)
North	0.9x 0.77	x	5.98	x	13.12	x	0.51	x	0.8	=	22.18	(74)
North	0.9x 0.77	x	2.1	x	13.12	x	0.63	x	0.7	=	8.42	(74)
North	0.9x 0.77	x	2.81	x	13.12	x	0.63	x	0.7	=	22.53	(74)
North	0.9x 0.77	x	5.98	x	8.86	x	0.51	x	0.8	=	14.99	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	2.1	x	8.86	x	0.63	x	0.7	=	5.69	(74)
North	0.9x	0.77	x	2.81	x	8.86	x	0.63	x	0.7	=	15.23	(74)
East	0.9x	0.77	x	6.67	x	19.64	x	0.51	x	0.8	=	37.04	(76)
East	0.9x	0.77	x	7.82	x	19.64	x	0.51	x	0.8	=	43.43	(76)
East	0.9x	0.77	x	6.67	x	38.42	x	0.51	x	0.8	=	72.46	(76)
East	0.9x	0.77	x	7.82	x	38.42	x	0.51	x	0.8	=	84.95	(76)
East	0.9x	0.77	x	6.67	x	63.27	x	0.51	x	0.8	=	119.33	(76)
East	0.9x	0.77	x	7.82	x	63.27	x	0.51	x	0.8	=	139.9	(76)
East	0.9x	0.77	x	6.67	x	92.28	x	0.51	x	0.8	=	174.03	(76)
East	0.9x	0.77	x	7.82	x	92.28	x	0.51	x	0.8	=	204.04	(76)
East	0.9x	0.77	x	6.67	x	113.09	x	0.51	x	0.8	=	213.28	(76)
East	0.9x	0.77	x	7.82	x	113.09	x	0.51	x	0.8	=	250.05	(76)
East	0.9x	0.77	x	6.67	x	115.77	x	0.51	x	0.8	=	218.33	(76)
East	0.9x	0.77	x	7.82	x	115.77	x	0.51	x	0.8	=	255.98	(76)
East	0.9x	0.77	x	6.67	x	110.22	x	0.51	x	0.8	=	207.86	(76)
East	0.9x	0.77	x	7.82	x	110.22	x	0.51	x	0.8	=	243.7	(76)
East	0.9x	0.77	x	6.67	x	94.68	x	0.51	x	0.8	=	178.55	(76)
East	0.9x	0.77	x	7.82	x	94.68	x	0.51	x	0.8	=	209.33	(76)
East	0.9x	0.77	x	6.67	x	73.59	x	0.51	x	0.8	=	138.78	(76)
East	0.9x	0.77	x	7.82	x	73.59	x	0.51	x	0.8	=	162.71	(76)
East	0.9x	0.77	x	6.67	x	45.59	x	0.51	x	0.8	=	85.98	(76)
East	0.9x	0.77	x	7.82	x	45.59	x	0.51	x	0.8	=	100.8	(76)
East	0.9x	0.77	x	6.67	x	24.49	x	0.51	x	0.8	=	46.18	(76)
East	0.9x	0.77	x	7.82	x	24.49	x	0.51	x	0.8	=	54.15	(76)
East	0.9x	0.77	x	6.67	x	16.15	x	0.51	x	0.8	=	30.46	(76)
East	0.9x	0.77	x	7.82	x	16.15	x	0.51	x	0.8	=	35.71	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
West	0.9x	0.77	x	2.1	x	19.64	x	0.63	x	0.7	=	12.6	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.63	x	0.7	=	24.66	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.63	x	0.7	=	40.61	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.1	x	92.28	x	0.63	x	0.7	=	59.22	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.63	x	0.7	=	72.58	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.63	x	0.7	=	74.3	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.63	x	0.7	=	70.74	(80)
West	0.9x	0.77	x	2.1	x	94.68	x	0.63	x	0.7	=	60.76	(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.63	x	0.7	=	47.23	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.63	x	0.7	=	29.26	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.63	x	0.7	=	15.72	(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.63	x	0.7	=	10.37	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	166.14	313.51	502.28	732.68	912.25	943.51	894.07	755.92	582.26	367.01	204.74	138.37	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	703.89	847.17	1015.56	1214.27	1361.39	1363.46	1296.83	1166.57	1011.03	827.68	700.93	661.44	(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=	0.96	0.93	0.86	0.73	0.56	0.4	0.3	0.34	0.56	0.82	0.94	0.97	(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=	20.39	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=	0.96	0.92	0.85	0.71	0.54	0.37	0.26	0.3	0.52	0.8	0.93	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.39	20.4	20.4	20.41	20.41	20.42	20.42	20.42	20.41	20.41	20.4	20.4	(90)

fLA = Living area ÷ (4) = 0.36 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.61	20.61	20.61	20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.61	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.61	20.61	20.61	20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.62	20.61	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.92	0.86	0.72	0.55	0.38	0.27	0.32	0.54	0.81	0.93	0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	674.02	783.48	868.72	872.21	743.64	521.95	354.24	369.09	542.2	667.73	652.39	637.93	(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=	1501.41	1442.31	1291.95	1057.93	802.97	534.74	357.19	373.97	582.23	902.01	1223.77	1494.44	(97)

SAP WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	615.58	442.73	314.88	133.72	44.14	0	0	0	0	174.3	411.39	637.24

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2773.98 (98)

Space heating requirement in kWh/m²/year 36.5 (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 1 512.62 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	615.58	442.73	314.88	133.72	44.14	0	0	0	0	174.3	411.39	637.24	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	120.08	86.37	61.43	26.09	8.61	0	0	0	0	34	80.25	124.31	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 541.14 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	162.16	142.23	147.72	130.14	125.87	110.09	103.47	116.66	117.43	135.06	145.68	157.49

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	83.51	73.25	76.07	67.02	64.82	56.7	53.28	60.08	60.47	69.55	75.02	81.1

Total = Sum(219a)$_{1...12}$ = 820.88 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		541.14
Water heating fuel used		820.88
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	202.59	(230a)
warm air heating system fans	104.88	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		307.47 (231)
Electricity for lighting		332.01 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2001.5 (338)

10a. Fuel costs - individual heating systems:

SAP WorkSheet: New dwelling design stage

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		13.19	x 0.01 =	71.38	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	108.27	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	40.56	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	43.79	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				264	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.92	(257)
SAP rating (Section 12)	87.22	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	280.85	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	426.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =				706.89	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	159.58	(267)
Electricity for lighting	(232) x		0.519	=	172.31	(268)
Total CO2, kg/year		sum of (265)…(271) =			1038.78	(272)
CO2 emissions per m²		(272) ÷ (4) =			13.67	(273)
EI rating (section 14)					88	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		3.07	=	1661.29	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2520.11	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4181.4	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	943.94	(267)

SAP WorkSheet: New dwelling design stage

Electricity for lighting	(232)	x	0	=	1019.28 (268)
'Total Primary Energy			sum of (265)…(271) =		6144.62 (272)
Primary energy kWh/m²/year			(272) ÷ (4) =		80.85 (273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 18

Address : FLAT 18, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76 (1a)	x	2.3 (2a)	=	174.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	174.8	(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) =	0.17	(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)			0.42	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.3	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.38	0.37	0.36	0.32	0.32	0.28	0.28	0.27	0.3	0.32	0.33	0.35

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=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.89	x	1	=	1.89			(26)
Windows Type 1			3.52	x1/[1/(1.4)+ 0.04]		=	4.67			(27)
Windows Type 2			4.13	x1/[1/(1.4)+ 0.04]		=	5.48			(27)
Windows Type 3			3.16	x1/[1/(1.4)+ 0.04]		=	4.19			(27)
Windows Type 4			1.11	x1/[1/(1.4)+ 0.04]		=	1.47			(27)
Windows Type 5			1.11	x1/[1/(1.4)+ 0.04]		=	1.47			(27)
Windows Type 6			1.48	x1/[1/(1.4)+ 0.04]		=	1.96			(27)
Windows Type 7			1.11	x1/[1/(1.4)+ 0.04]		=	1.47			(27)
Floor			76	x	0.13	=	9.879999			(28)
Walls Type1	58.88	17.1	41.78	x	0.18	=	7.52			(29)
Walls Type2	5.75	0	5.75	x	0.18	=	1.04			(29)
Walls Type3	10.81	1.89	8.92	x	0.18	=	1.61			(29)
Walls Type4	8.74	0	8.74	x	0.18	=	1.57			(29)
Roof	29	0	29	x	0.13	=	3.77			(30)
Total area of elements, m²			189.18							(31)
Party wall			16.56	x	0	=	0			(32)
Party ceiling			47							(32b)
Internal wall **			143.52							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 49.94 (33)

TER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12067.79 (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 19.36 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 69.31 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	32.93	32.77	32.61	31.88	31.75	31.11	31.11	30.99	31.35	31.75	32.02	32.31	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	102.23	102.08	101.92	101.19	101.05	100.42	100.42	100.3	100.66	101.05	101.33	101.62	

Average = Sum(39)$_{1...12}$ /12= 101.19 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.35	1.34	1.34	1.33	1.33	1.32	1.32	1.32	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 2.38 (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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

TER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	197.34	174	182.9	164.18	161.05	144.14	138.65	151.84	151.48	170.24	179.73	192.67	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	197.34	174	182.9	164.18	161.05	144.14	138.65	151.84	151.48	170.24	179.73	192.67	

Output from water heater (annual)$_{1...12}$: 2008.22 (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=	88.64	78.65	83.84	76.87	76.57	70.2	69.12	73.51	72.64	79.62	82.04	87.08	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	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	18.12	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=	119.13	117.04	112.68	106.76	102.92	97.51	92.91	98.8	100.89	107.02	113.94	117.05	(72)

TER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	410.55	408.54	395.55	374.59	353.34	332.8	319.42	325.22	335.95	357.12	381.45	399.68	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	3.16	x	10.63	x	0.63	x	0.7	=	10.27	(74)
North	0.9x 0.77	x	1.11	x	10.63	x	0.63	x	0.7	=	3.61	(74)
North	0.9x 0.77	x	1.48	x	10.63	x	0.63	x	0.7	=	9.62	(74)
North	0.9x 0.77	x	3.16	x	20.32	x	0.63	x	0.7	=	19.62	(74)
North	0.9x 0.77	x	1.11	x	20.32	x	0.63	x	0.7	=	6.89	(74)
North	0.9x 0.77	x	1.48	x	20.32	x	0.63	x	0.7	=	18.38	(74)
North	0.9x 0.77	x	3.16	x	34.53	x	0.63	x	0.7	=	33.35	(74)
North	0.9x 0.77	x	1.11	x	34.53	x	0.63	x	0.7	=	11.71	(74)
North	0.9x 0.77	x	1.48	x	34.53	x	0.63	x	0.7	=	31.24	(74)
North	0.9x 0.77	x	3.16	x	55.46	x	0.63	x	0.7	=	53.56	(74)
North	0.9x 0.77	x	1.11	x	55.46	x	0.63	x	0.7	=	18.82	(74)
North	0.9x 0.77	x	1.48	x	55.46	x	0.63	x	0.7	=	50.17	(74)
North	0.9x 0.77	x	3.16	x	74.72	x	0.63	x	0.7	=	72.16	(74)
North	0.9x 0.77	x	1.11	x	74.72	x	0.63	x	0.7	=	25.35	(74)
North	0.9x 0.77	x	1.48	x	74.72	x	0.63	x	0.7	=	67.59	(74)
North	0.9x 0.77	x	3.16	x	79.99	x	0.63	x	0.7	=	77.24	(74)
North	0.9x 0.77	x	1.11	x	79.99	x	0.63	x	0.7	=	27.13	(74)
North	0.9x 0.77	x	1.48	x	79.99	x	0.63	x	0.7	=	72.36	(74)
North	0.9x 0.77	x	3.16	x	74.68	x	0.63	x	0.7	=	72.12	(74)
North	0.9x 0.77	x	1.11	x	74.68	x	0.63	x	0.7	=	25.33	(74)
North	0.9x 0.77	x	1.48	x	74.68	x	0.63	x	0.7	=	67.55	(74)
North	0.9x 0.77	x	3.16	x	59.25	x	0.63	x	0.7	=	57.22	(74)
North	0.9x 0.77	x	1.11	x	59.25	x	0.63	x	0.7	=	20.1	(74)
North	0.9x 0.77	x	1.48	x	59.25	x	0.63	x	0.7	=	53.6	(74)
North	0.9x 0.77	x	3.16	x	41.52	x	0.63	x	0.7	=	40.09	(74)
North	0.9x 0.77	x	1.11	x	41.52	x	0.63	x	0.7	=	14.08	(74)
North	0.9x 0.77	x	1.48	x	41.52	x	0.63	x	0.7	=	37.56	(74)
North	0.9x 0.77	x	3.16	x	24.19	x	0.63	x	0.7	=	23.36	(74)
North	0.9x 0.77	x	1.11	x	24.19	x	0.63	x	0.7	=	8.21	(74)
North	0.9x 0.77	x	1.48	x	24.19	x	0.63	x	0.7	=	21.88	(74)
North	0.9x 0.77	x	3.16	x	13.12	x	0.63	x	0.7	=	12.67	(74)
North	0.9x 0.77	x	1.11	x	13.12	x	0.63	x	0.7	=	4.45	(74)
North	0.9x 0.77	x	1.48	x	13.12	x	0.63	x	0.7	=	11.87	(74)
North	0.9x 0.77	x	3.16	x	8.86	x	0.63	x	0.7	=	8.56	(74)

TER WorkSheet: New dwelling design stage

North	0.9x	0.77	x	1.11	x	8.86	x	0.63	x	0.7	=	3.01	(74)
North	0.9x	0.77	x	1.48	x	8.86	x	0.63	x	0.7	=	8.02	(74)
East	0.9x	0.77	x	3.52	x	19.64	x	0.63	x	0.7	=	21.13	(76)
East	0.9x	0.77	x	4.13	x	19.64	x	0.63	x	0.7	=	24.79	(76)
East	0.9x	0.77	x	3.52	x	38.42	x	0.63	x	0.7	=	41.33	(76)
East	0.9x	0.77	x	4.13	x	38.42	x	0.63	x	0.7	=	48.49	(76)
East	0.9x	0.77	x	3.52	x	63.27	x	0.63	x	0.7	=	68.07	(76)
East	0.9x	0.77	x	4.13	x	63.27	x	0.63	x	0.7	=	79.86	(76)
East	0.9x	0.77	x	3.52	x	92.28	x	0.63	x	0.7	=	99.27	(76)
East	0.9x	0.77	x	4.13	x	92.28	x	0.63	x	0.7	=	116.47	(76)
East	0.9x	0.77	x	3.52	x	113.09	x	0.63	x	0.7	=	121.66	(76)
East	0.9x	0.77	x	4.13	x	113.09	x	0.63	x	0.7	=	142.74	(76)
East	0.9x	0.77	x	3.52	x	115.77	x	0.63	x	0.7	=	124.54	(76)
East	0.9x	0.77	x	4.13	x	115.77	x	0.63	x	0.7	=	146.12	(76)
East	0.9x	0.77	x	3.52	x	110.22	x	0.63	x	0.7	=	118.57	(76)
East	0.9x	0.77	x	4.13	x	110.22	x	0.63	x	0.7	=	139.12	(76)
East	0.9x	0.77	x	3.52	x	94.68	x	0.63	x	0.7	=	101.85	(76)
East	0.9x	0.77	x	4.13	x	94.68	x	0.63	x	0.7	=	119.5	(76)
East	0.9x	0.77	x	3.52	x	73.59	x	0.63	x	0.7	=	79.16	(76)
East	0.9x	0.77	x	4.13	x	73.59	x	0.63	x	0.7	=	92.88	(76)
East	0.9x	0.77	x	3.52	x	45.59	x	0.63	x	0.7	=	49.04	(76)
East	0.9x	0.77	x	4.13	x	45.59	x	0.63	x	0.7	=	57.54	(76)
East	0.9x	0.77	x	3.52	x	24.49	x	0.63	x	0.7	=	26.34	(76)
East	0.9x	0.77	x	4.13	x	24.49	x	0.63	x	0.7	=	30.91	(76)
East	0.9x	0.77	x	3.52	x	16.15	x	0.63	x	0.7	=	17.37	(76)
East	0.9x	0.77	x	4.13	x	16.15	x	0.63	x	0.7	=	20.39	(76)
South	0.9x	0.77	x	1.11	x	46.75	x	0.63	x	0.7	=	15.86	(78)
South	0.9x	0.77	x	1.11	x	76.57	x	0.63	x	0.7	=	25.97	(78)
South	0.9x	0.77	x	1.11	x	97.53	x	0.63	x	0.7	=	33.09	(78)
South	0.9x	0.77	x	1.11	x	110.23	x	0.63	x	0.7	=	37.39	(78)
South	0.9x	0.77	x	1.11	x	114.87	x	0.63	x	0.7	=	38.97	(78)
South	0.9x	0.77	x	1.11	x	110.55	x	0.63	x	0.7	=	37.5	(78)
South	0.9x	0.77	x	1.11	x	108.01	x	0.63	x	0.7	=	36.64	(78)
South	0.9x	0.77	x	1.11	x	104.89	x	0.63	x	0.7	=	35.58	(78)
South	0.9x	0.77	x	1.11	x	101.89	x	0.63	x	0.7	=	34.56	(78)
South	0.9x	0.77	x	1.11	x	82.59	x	0.63	x	0.7	=	28.02	(78)
South	0.9x	0.77	x	1.11	x	55.42	x	0.63	x	0.7	=	18.8	(78)
South	0.9x	0.77	x	1.11	x	40.4	x	0.63	x	0.7	=	13.7	(78)
West	0.9x	0.77	x	1.11	x	19.64	x	0.63	x	0.7	=	6.66	(80)
West	0.9x	0.77	x	1.11	x	38.42	x	0.63	x	0.7	=	13.03	(80)
West	0.9x	0.77	x	1.11	x	63.27	x	0.63	x	0.7	=	21.46	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.11	x	92.28	x	0.63	x	0.7	=	31.3	(80)
West	0.9x	0.77	x	1.11	x	113.09	x	0.63	x	0.7	=	38.36	(80)
West	0.9x	0.77	x	1.11	x	115.77	x	0.63	x	0.7	=	39.27	(80)
West	0.9x	0.77	x	1.11	x	110.22	x	0.63	x	0.7	=	37.39	(80)
West	0.9x	0.77	x	1.11	x	94.68	x	0.63	x	0.7	=	32.12	(80)
West	0.9x	0.77	x	1.11	x	73.59	x	0.63	x	0.7	=	24.96	(80)
West	0.9x	0.77	x	1.11	x	45.59	x	0.63	x	0.7	=	15.47	(80)
West	0.9x	0.77	x	1.11	x	24.49	x	0.63	x	0.7	=	8.31	(80)
West	0.9x	0.77	x	1.11	x	16.15	x	0.63	x	0.7	=	5.48	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	91.94	173.73	278.78	407	506.83	524.17	496.72	419.96	323.31	203.51	113.35	76.53	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	502.48	582.27	674.33	781.59	860.16	856.97	816.13	745.18	659.26	560.63	494.79	476.21	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.95	0.85	0.69	0.53	0.59	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=	19.56	19.73	20.03	20.42	20.75	20.93	20.98	20.97	20.83	20.39	19.9	19.53	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.81	19.81	19.81	19.82	19.82	19.82	19.82	19.83	19.82	19.82	19.81	19.81	(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	0.58	0.39	0.45	0.76	0.96	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	17.91	18.16	18.59	19.15	19.58	19.78	19.82	19.82	19.69	19.12	18.42	17.87	(90)

fLA = Living area ÷ (4) = 0.36 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.5	18.71	19.1	19.6	20	20.19	20.23	20.23	20.09	19.58	18.95	18.46	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.5	18.71	19.1	19.6	20	20.19	20.23	20.23	20.09	19.58	18.95	18.46	(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	0.99	0.97	0.92	0.81	0.62	0.44	0.5	0.78	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	499.52	575.53	655.57	720.9	694.17	529.52	359.37	374.24	514.27	533.94	489.23	473.97	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1451.32	1410.15	1284.16	1082.89	838.55	561.46	364.8	383.84	603.42	907.03	1200.3	1448.7	(97)

TER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	708.14	560.87	467.67	260.63	107.41	0	0	0	0	277.58	511.98	725.2

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3619.48 (98)

Space heating requirement in kWh/m²/year 47.62 (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)	708.14	560.87	467.67	260.63	107.41	0	0	0	0	277.58	511.98	725.2	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	757.37	599.86	500.18	278.75	114.88	0	0	0	0	296.88	547.57	775.61	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 3871.1 (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)

	197.34	174	182.9	164.18	161.05	144.14	138.65	151.84	151.48	170.24	179.73	192.67

Efficiency of water heater 79.8 (216)

(217)m=	87.93	87.72	87.21	86.04	83.76	79.8	79.8	79.8	79.8	86.11	87.45	88.02

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	224.43	198.37	209.72	190.82	192.27	180.63	173.75	190.27	189.82	197.69	205.51	218.88

Total = Sum(219a)$_{1...12}$ = 2372.17 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		3871.1
Water heating fuel used		2372.17
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		331.97 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		6650.24 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

TER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	836.16	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	512.39	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1348.55	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	172.29	(268)
Total CO2, kg/year		sum of (265)…(271) =			1559.76	(272)

TER = 30.28 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:42

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 55.7m²
Site Reference : 43LS **Plot Reference:** FLAT 19
Address : FLAT 19, 43 London Street, Reading, RG1 4PS

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)	25.86 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.83 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.2 kWh/m²	
		Fail

Excess energy = 3.01 kg/m² (07.3 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.22 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	0.94 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	6.92m²
Windows facing: North	11.3m²
Windows facing: South	2.1m²
Windows facing: North	1.71m²
Windows facing: East	3.42m²
Windows facing: West	1.71m²
Windows facing: West	2.1m²
Ventilation rate:	5.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 19

Address : FLAT 19, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7 (1a)	x	2.3 (2a)	=	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.11	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.92	x	1/[1/(0.92)+ 0.04]	=	6.14			(27)
Windows Type 2			5.65	x	1/[1/(0.92)+ 0.04]	=	5.01			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 5			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 6			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 7			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Walls Type1	52.21	29.26	22.95	x	0.16	=	3.67	14	321.3	(29)
Walls Type2	16.56	2.1	14.46	x	0.14	=	2.02	14	202.44	(29)
Walls Type3	3.68	0	3.68	x	0.22	=	0.81	14	51.52	(29)
Total area of elements, m²			72.45							(31)
Party wall			15.87	x	0	=	0	20	317.4	(32)
Party floor			55.7					30	1671	(32a)
Party ceiling			55.7					20	1114	(32b)
Internal wall **			99.36					9	894.24	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 35 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4571.9 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 82.08 (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 — 10.87 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 45.87 (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=	15.3	15.11	14.93	14	13.82	12.89	12.89	12.71	13.26	13.82	14.19	14.56	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.16	60.98	60.79	59.87	59.69	58.76	58.76	58.58	59.13	59.69	60.06	60.43	

Average = Sum(39)$_{1...12}$ /12= 59.82 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.1	1.09	1.09	1.07	1.07	1.05	1.05	1.05	1.06	1.07	1.08	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 — 1.86 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 78.32 (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=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Total = Sum(44)$_{1...12}$ = 939.88 (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = 1232.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	(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=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Output from water heater (annual)$_{1...12}$	1397.9	(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=	42.48	37.16	38.34	33.43	32.07	27.68	25.65	29.43	29.78	34.71	37.89	41.14	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.44	12.83	10.43	7.9	5.9	4.98	5.39	7	9.4	11.93	13.92	14.84	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	161.99	163.67	159.43	150.42	139.03	128.33	121.19	119.5	123.74	132.76	144.14	154.84	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	57.1	55.29	51.53	46.43	43.11	38.44	34.47	39.56	41.36	46.65	52.62	55.3	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	292.08	290.34	279.95	263.29	246.6	230.31	219.6	224.62	233.05	249.89	269.24	283.54	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.65	x	10.63	x	0.51	x	0.8	=	33.97	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	5.65	x	20.32	x	0.51	x	0.8	=	64.93	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	5.65	x	34.53	x	0.51	x	0.8	=	110.32	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	5.65	x	55.46	x	0.51	x	0.8	=	177.21	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	5.65	x	74.72	x	0.51	x	0.8	=	238.72	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	5.65	x	79.99	x	0.51	x	0.8	=	255.55	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	5.65	x	74.68	x	0.51	x	0.8	=	238.59	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	5.65	x	59.25	x	0.51	x	0.8	=	189.29	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	5.65	x	41.52	x	0.51	x	0.8	=	132.65	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	5.65	x	24.19	x	0.51	x	0.8	=	77.29	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	5.65	x	13.12	x	0.51	x	0.8	=	41.91	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	5.65	x	8.86	x	0.51	x	0.8	=	28.32	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	6.92	x	19.64	x	0.51	x	0.8	=	38.43	(76)
East	0.9x 0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	20.53	(76)
East	0.9x 0.77	x	6.92	x	38.42	x	0.51	x	0.8	=	75.17	(76)
East	0.9x 0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	40.16	(76)
East	0.9x 0.77	x	6.92	x	63.27	x	0.51	x	0.8	=	123.8	(76)
East	0.9x 0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	66.13	(76)
East	0.9x 0.77	x	6.92	x	92.28	x	0.51	x	0.8	=	180.55	(76)
East	0.9x 0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	96.45	(76)
East	0.9x 0.77	x	6.92	x	113.09	x	0.51	x	0.8	=	221.28	(76)
East	0.9x 0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	118.2	(76)
East	0.9x 0.77	x	6.92	x	115.77	x	0.51	x	0.8	=	226.52	(76)
East	0.9x 0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	121	(76)
East	0.9x 0.77	x	6.92	x	110.22	x	0.51	x	0.8	=	215.65	(76)
East	0.9x 0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	115.2	(76)
East	0.9x 0.77	x	6.92	x	94.68	x	0.51	x	0.8	=	185.24	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	98.95	(76)
East	0.9x	0.77	x	6.92	x	73.59	x	0.51	x	0.8	=	143.98	(76)
East	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	76.92	(76)
East	0.9x	0.77	x	6.92	x	45.59	x	0.51	x	0.8	=	89.2	(76)
East	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	47.65	(76)
East	0.9x	0.77	x	6.92	x	24.49	x	0.51	x	0.8	=	47.92	(76)
East	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	25.6	(76)
East	0.9x	0.77	x	6.92	x	16.15	x	0.51	x	0.8	=	31.6	(76)
East	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	16.88	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
West	0.9x	0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	10.26	(80)
West	0.9x	0.77	x	2.1	x	19.64	x	0.63	x	0.7	=	12.6	(80)
West	0.9x	0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	20.08	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.63	x	0.7	=	24.66	(80)
West	0.9x	0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	33.07	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	48.23	(80)
West	0.9x	0.77	x	2.1	x	92.28	x	0.63	x	0.7	=	59.22	(80)
West	0.9x	0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	59.1	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.63	x	0.7	=	72.58	(80)
West	0.9x	0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	60.5	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.63	x	0.7	=	74.3	(80)
West	0.9x	0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	57.6	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.63	x	0.7	=	70.74	(80)
West	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	49.48	(80)
West	0.9x	0.77	x	2.1	x	94.68	x	0.63	x	0.7	=	60.76	(80)
West	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	38.46	(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.63	x	0.7	=	47.23	(80)
West	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	23.82	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.63	x	0.7	=	29.26	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	12.8	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.63	x	0.7	=	15.72	(80)
West	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	8.44	(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.63	x	0.7	=	10.37	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.36	284.75	454.57	661.4	822.65	850.62	806.13	682.01	526.32	332.86	186.36	126.17	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	443.44	575.09	734.52	924.69	1069.25	1080.93	1025.72	906.63	759.37	582.75	455.6	409.71	(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=	0.92	0.86	0.77	0.62	0.46	0.33	0.25	0.29	0.48	0.73	0.88	0.93	(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=	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=	0.91	0.85	0.75	0.6	0.44	0.31	0.22	0.26	0.45	0.71	0.87	0.92	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)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	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.67	20.67	20.67	20.68	20.68	20.69	20.69	20.69	20.68	20.68	20.68	20.68	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.67	20.67	20.67	20.68	20.68	20.69	20.69	20.69	20.68	20.68	20.68	20.68	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.91	0.86	0.76	0.61	0.45	0.32	0.23	0.27	0.46	0.72	0.87	0.93	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	405.61	493.04	557.66	561.04	480.46	341.15	234.72	243.13	347.73	418.82	398.29	379.64	(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=	1001.44	961.88	861.75	705.25	536.01	357.59	240.07	251.09	389.29	601.67	815.47	995.6	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	443.29	315.06	226.24	103.83	41.33	0	0	0	0	136.04	300.37	458.27	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 2024.45 (98)

Space heating requirement in kWh/m²/year 36.35 (99)

DER WorkSheet: New dwelling design stage

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		509.18 (206)
Efficiency of secondary/supplementary heating system, %		100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	443.29	315.06	226.24	103.83	41.33	0	0	0	0	136.04	300.37	458.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	87.06	61.88	44.43	20.39	8.12	0	0	0	0	26.72	58.99	90	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 397.59 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8

Efficiency of water heater 194.18 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	73.04	64.09	66.63	58.78	56.92	49.88	46.96	52.82	53.13	61	65.69	70.96

Total = Sum(219a)$_{1...12}$ = 719.9 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		397.59
Water heating fuel used		719.9
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	142.62	(230a)
warm air heating system fans	76.87	(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	219.48 (231)
Electricity for lighting		255.04 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1592.01 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year
Space heating (main system 1)	(211)	x	0.519	=	206.35 (261)
Space heating (secondary)	(215)	x	0.519	=	0 (263)
Water heating	(219)	x	0.519	=	373.63 (264)

DER WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			579.98	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	113.91	(267)
Electricity for lighting	(232) x	0.519	=	132.36	(268)
Total CO2, kg/year	sum of (265)…(271) =			826.25	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			14.83	(273)
EI rating (section 14)				89	(274)

Predicted Energy Assessment

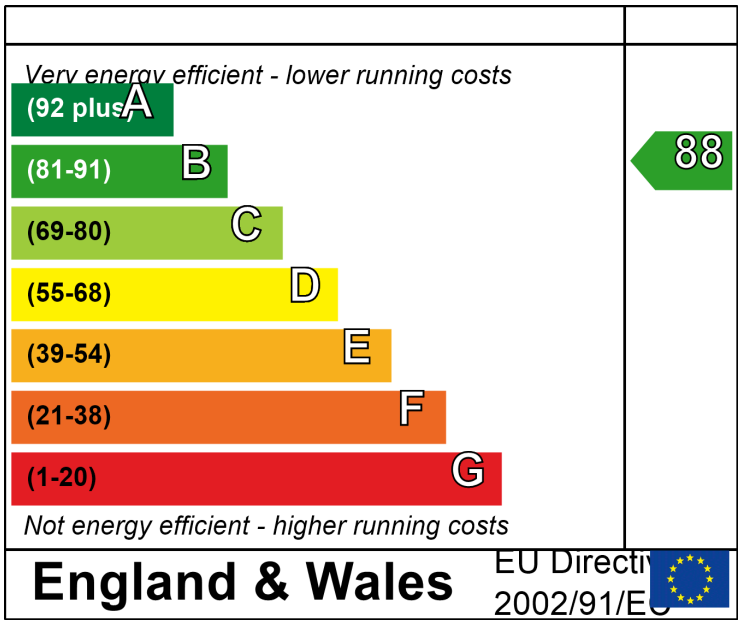
FLAT 19
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 55.7 m²

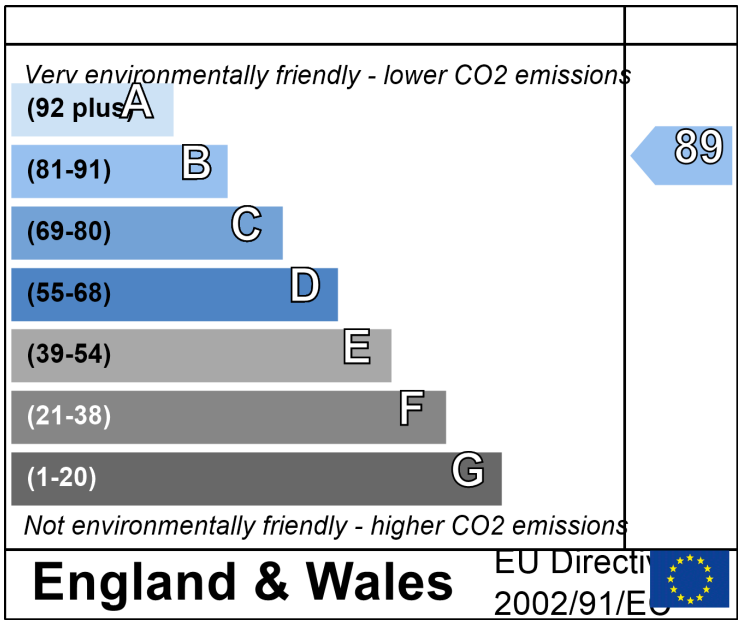
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 19

Address : FLAT 19, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7 (1a)	x	2.3 (2a)	=	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.11	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.92	x	1/[1/(0.92)+ 0.04]	=	6.14			(27)
Windows Type 2			5.65	x	1/[1/(0.92)+ 0.04]	=	5.01			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 5			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 6			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 7			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Walls Type1	52.21	29.26	22.95	x	0.16	=	3.67	14	321.3	(29)
Walls Type2	16.56	2.1	14.46	x	0.14	=	2.02	14	202.44	(29)
Walls Type3	3.68	0	3.68	x	0.22	=	0.81	14	51.52	(29)
Total area of elements, m²			72.45							(31)
Party wall			15.87	x	0	=	0	20	317.4	(32)
Party floor			55.7					30	1671	(32a)
Party ceiling			55.7					20	1114	(32b)
Internal wall **			99.36					9	894.24	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 35 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4571.9 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 82.08 (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 | 10.87 | (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = | 45.87 | (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=	15.3	15.11	14.93	14	13.82	12.89	12.89	12.71	13.26	13.82	14.19	14.56	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.16	60.98	60.79	59.87	59.69	58.76	58.76	58.58	59.13	59.69	60.06	60.43	

Average = Sum(39)$_{1...12}$ /12= | 59.82 | (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.1	1.09	1.09	1.07	1.07	1.05	1.05	1.05	1.06	1.07	1.08	1.08	

Average = Sum(40)$_{1...12}$ /12= | 1.07 | (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 | 1.86 | (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 | 78.32 | (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=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Total = Sum(44)$_{1...12}$ = | 939.88 | (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = | 1232.34 | (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel | 180 | (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): | 0.54 | (48)

Temperature factor from Table 2b | 0.4536 | (49)

Energy lost from water storage, kWh/year (48) x (49) = | 0 | (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) | 0 | (51)

If community heating see section 4.3

Volume factor from Table 2a | 0 | (52)

Temperature factor from Table 2b | 0 | (53)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	(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=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Output from water heater (annual)$_{1...12}$ 1397.9 (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=	42.48	37.16	38.34	33.43	32.07	27.68	25.65	29.43	29.78	34.71	37.89	41.14	(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=	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	36.1	32.07	26.08	19.74	14.76	12.46	13.46	17.5	23.49	29.82	34.81	37.11	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	241.77	244.28	237.96	224.5	207.51	191.54	180.87	178.37	184.69	198.15	215.14	231.1	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48	48	48	48	48	48	48	48	48	48	48	48	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	57.1	55.29	51.53	46.43	43.11	38.44	34.47	39.56	41.36	46.65	52.62	55.3	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	427.82	424.49	408.42	383.52	358.23	335.29	321.66	328.27	342.39	367.47	395.41	416.36	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.65	x	10.63	x	0.51	x	0.8	=	33.97	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	5.65	x	20.32	x	0.51	x	0.8	=	64.93	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	5.65	x	34.53	x	0.51	x	0.8	=	110.32	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	5.65	x	55.46	x	0.51	x	0.8	=	177.21	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	5.65	x	74.72	x	0.51	x	0.8	=	238.72	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	5.65	x	79.99	x	0.51	x	0.8	=	255.55	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	5.65	x	74.68	x	0.51	x	0.8	=	238.59	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	5.65	x	59.25	x	0.51	x	0.8	=	189.29	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	5.65	x	41.52	x	0.51	x	0.8	=	132.65	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	5.65	x	24.19	x	0.51	x	0.8	=	77.29	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	5.65	x	13.12	x	0.51	x	0.8	=	41.91	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	5.65	x	8.86	x	0.51	x	0.8	=	28.32	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	6.92	x	19.64	x	0.51	x	0.8	=	38.43	(76)
East	0.9x 0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	20.53	(76)
East	0.9x 0.77	x	6.92	x	38.42	x	0.51	x	0.8	=	75.17	(76)
East	0.9x 0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	40.16	(76)
East	0.9x 0.77	x	6.92	x	63.27	x	0.51	x	0.8	=	123.8	(76)
East	0.9x 0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	66.13	(76)
East	0.9x 0.77	x	6.92	x	92.28	x	0.51	x	0.8	=	180.55	(76)
East	0.9x 0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	96.45	(76)
East	0.9x 0.77	x	6.92	x	113.09	x	0.51	x	0.8	=	221.28	(76)
East	0.9x 0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	118.2	(76)
East	0.9x 0.77	x	6.92	x	115.77	x	0.51	x	0.8	=	226.52	(76)
East	0.9x 0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	121	(76)
East	0.9x 0.77	x	6.92	x	110.22	x	0.51	x	0.8	=	215.65	(76)
East	0.9x 0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	115.2	(76)
East	0.9x 0.77	x	6.92	x	94.68	x	0.51	x	0.8	=	185.24	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	98.95	(76)
East	0.9x	0.77	x	6.92	x	73.59	x	0.51	x	0.8	=	143.98	(76)
East	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	76.92	(76)
East	0.9x	0.77	x	6.92	x	45.59	x	0.51	x	0.8	=	89.2	(76)
East	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	47.65	(76)
East	0.9x	0.77	x	6.92	x	24.49	x	0.51	x	0.8	=	47.92	(76)
East	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	25.6	(76)
East	0.9x	0.77	x	6.92	x	16.15	x	0.51	x	0.8	=	31.6	(76)
East	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	16.88	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
West	0.9x	0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	10.26	(80)
West	0.9x	0.77	x	2.1	x	19.64	x	0.63	x	0.7	=	12.6	(80)
West	0.9x	0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	20.08	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.63	x	0.7	=	24.66	(80)
West	0.9x	0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	33.07	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	48.23	(80)
West	0.9x	0.77	x	2.1	x	92.28	x	0.63	x	0.7	=	59.22	(80)
West	0.9x	0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	59.1	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.63	x	0.7	=	72.58	(80)
West	0.9x	0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	60.5	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.63	x	0.7	=	74.3	(80)
West	0.9x	0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	57.6	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.63	x	0.7	=	70.74	(80)
West	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	49.48	(80)
West	0.9x	0.77	x	2.1	x	94.68	x	0.63	x	0.7	=	60.76	(80)
West	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	38.46	(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.63	x	0.7	=	47.23	(80)
West	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	23.82	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.63	x	0.7	=	29.26	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	12.8	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.63	x	0.7	=	15.72	(80)
West	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	8.44	(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.63	x	0.7	=	10.37	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.36	284.75	454.57	661.4	822.65	850.62	806.13	682.01	526.32	332.86	186.36	126.17	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	579.18	709.24	862.99	1044.91	1180.88	1185.91	1127.78	1010.28	868.7	700.33	581.77	542.53	(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=	0.87	0.81	0.71	0.57	0.43	0.3	0.22	0.26	0.43	0.66	0.82	0.88	(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=	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=	0.86	0.8	0.7	0.55	0.41	0.28	0.2	0.23	0.4	0.64	0.81	0.88	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)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	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.67	20.67	20.67	20.68	20.68	20.69	20.69	20.69	20.68	20.68	20.68	20.68	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.67	20.67	20.67	20.68	20.68	20.69	20.69	20.69	20.68	20.68	20.68	20.68	(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=	0.86	0.8	0.7	0.56	0.41	0.29	0.21	0.24	0.41	0.65	0.81	0.88	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	500.69	569.5	608.18	585.12	489.56	343.99	235.72	244.77	356.71	456.68	473.71	476.72	(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=	1001.44	961.88	861.75	705.25	536.01	357.59	240.07	251.09	389.29	601.67	815.47	995.6	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	372.55	263.68	188.66	86.49	34.56	0	0	0	0	107.87	246.06	386.05	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1685.93 (98)

Space heating requirement in kWh/m²/year 30.27 (99)

SAP WorkSheet: New dwelling design stage

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		509.18 (206)
Efficiency of secondary/supplementary heating system, %		100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	372.55	263.68	188.66	86.49	34.56	0	0	0	0	107.87	246.06	386.05	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	73.17	51.79	37.05	16.99	6.79	0	0	0	0	21.18	48.32	75.82	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 331.1 (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)

	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	73.04	64.09	66.63	58.78	56.92	49.88	46.96	52.82	53.13	61	65.69	70.96	

Total = Sum(219a)$_{1...12}$ = 719.9 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		331.1
Water heating fuel used		719.9
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	142.62	(230a)
warm air heating system fans	76.87	(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	219.48 (231)
Electricity for lighting		255.04 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1525.53 (338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year
Space heating - main system 1	(211) x	13.19 x 0.01 =	43.67 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	13.19	x 0.01 =	94.95	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	28.95	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a					
Energy for lighting	(232)	13.19	x 0.01 =	33.64	(250)
Additional standing charges (Table 12)				0	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			201.22	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.84	(257)
SAP rating (Section 12)		88.29	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

		Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	171.84	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	373.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =				545.47	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	113.91	(267)
Electricity for lighting	(232) x		0.519	=	132.36	(268)
Total CO2, kg/year	sum of (265)…(271) =				791.75	(272)
CO2 emissions per m²	(272) ÷ (4) =				14.21	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	1016.49	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2210.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3226.58	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	673.82	(267)
Electricity for lighting	(232) x		0	=	782.97	(268)
'Total Primary Energy	sum of (265)…(271) =				4683.36	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				84.08	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 19

Address : FLAT 19, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7 (1a)	x	2.3 (2a)	=	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.11	(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) =	0.16	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33

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=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			2.8	x1/[1/(1.4)+ 0.04]		=	3.71			(27)
Windows Type 2			2.28	x1/[1/(1.4)+ 0.04]		=	3.02			(27)
Windows Type 3			0.85	x1/[1/(1.4)+ 0.04]		=	1.13			(27)
Windows Type 4			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 5			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 6			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 7			0.85	x1/[1/(1.4)+ 0.04]		=	1.13			(27)
Walls Type1	52.21	11.82	40.39	x	0.18	=	7.27			(29)
Walls Type2	16.56	2.1	14.46	x	0.18	=	2.6			(29)
Walls Type3	3.68	0	3.68	x	0.18	=	0.66			(29)
Total area of elements, m²			72.45							(31)
Party wall			15.87	x	0	=	0			(32)
Party floor			55.7							(32a)
Party ceiling			55.7							(32b)
Internal wall **			99.36							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.31 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4816.06 (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

TER WorkSheet: New dwelling design stage

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 3.62 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = — 31.93 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	23.92	23.81	23.7	23.21	23.11	22.68	22.68	22.6	22.85	23.11	23.3	23.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	55.84	55.74	55.63	55.13	55.04	54.61	54.61	54.53	54.77	55.04	55.23	55.43	

Average = Sum(39)$_{1...12}$ /12= 55.13 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1	1	1	0.99	0.99	0.98	0.98	0.98	0.98	0.99	0.99	1	

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 1.86 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 78.32 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 939.88 (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = 1232.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(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): — 1.55 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0.84 (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)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)	0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98	

Output from water heater (annual)$_{1...12}$ 1812.13 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	81.88	72.74	77.74	71.55	71.47	65.8	65.04	68.82	67.91	74.1	76.01	80.54	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.47	12.85	10.45	7.91	5.92	4.99	5.4	7.01	9.41	11.95	13.95	14.87	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	161.99	163.67	159.43	150.42	139.03	128.33	121.19	119.5	123.74	132.76	144.14	154.84	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	110.05	108.24	104.48	99.38	96.06	91.39	87.42	92.51	94.31	99.6	105.57	108.25	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	340.38	338.63	328.24	311.57	294.87	278.58	267.87	272.89	281.34	298.18	317.53	331.83	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	2.28	x	10.63	x	0.63	x	0.7	=	14.82	(74)
North	0.9x 0.77	x	0.69	x	10.63	x	0.63	x	0.7	=	2.24	(74)
North	0.9x 0.77	x	2.28	x	20.32	x	0.63	x	0.7	=	28.32	(74)
North	0.9x 0.77	x	0.69	x	20.32	x	0.63	x	0.7	=	4.29	(74)
North	0.9x 0.77	x	2.28	x	34.53	x	0.63	x	0.7	=	48.12	(74)
North	0.9x 0.77	x	0.69	x	34.53	x	0.63	x	0.7	=	7.28	(74)
North	0.9x 0.77	x	2.28	x	55.46	x	0.63	x	0.7	=	77.29	(74)
North	0.9x 0.77	x	0.69	x	55.46	x	0.63	x	0.7	=	11.7	(74)
North	0.9x 0.77	x	2.28	x	74.72	x	0.63	x	0.7	=	104.12	(74)
North	0.9x 0.77	x	0.69	x	74.72	x	0.63	x	0.7	=	15.76	(74)
North	0.9x 0.77	x	2.28	x	79.99	x	0.63	x	0.7	=	111.47	(74)
North	0.9x 0.77	x	0.69	x	79.99	x	0.63	x	0.7	=	16.87	(74)
North	0.9x 0.77	x	2.28	x	74.68	x	0.63	x	0.7	=	104.07	(74)
North	0.9x 0.77	x	0.69	x	74.68	x	0.63	x	0.7	=	15.75	(74)
North	0.9x 0.77	x	2.28	x	59.25	x	0.63	x	0.7	=	82.57	(74)
North	0.9x 0.77	x	0.69	x	59.25	x	0.63	x	0.7	=	12.49	(74)
North	0.9x 0.77	x	2.28	x	41.52	x	0.63	x	0.7	=	57.86	(74)
North	0.9x 0.77	x	0.69	x	41.52	x	0.63	x	0.7	=	8.75	(74)
North	0.9x 0.77	x	2.28	x	24.19	x	0.63	x	0.7	=	33.71	(74)
North	0.9x 0.77	x	0.69	x	24.19	x	0.63	x	0.7	=	5.1	(74)
North	0.9x 0.77	x	2.28	x	13.12	x	0.63	x	0.7	=	18.28	(74)
North	0.9x 0.77	x	0.69	x	13.12	x	0.63	x	0.7	=	2.77	(74)
North	0.9x 0.77	x	2.28	x	8.86	x	0.63	x	0.7	=	12.35	(74)
North	0.9x 0.77	x	0.69	x	8.86	x	0.63	x	0.7	=	1.87	(74)
East	0.9x 0.77	x	2.8	x	19.64	x	0.63	x	0.7	=	16.81	(76)
East	0.9x 0.77	x	0.69	x	19.64	x	0.63	x	0.7	=	8.28	(76)
East	0.9x 0.77	x	2.8	x	38.42	x	0.63	x	0.7	=	32.88	(76)
East	0.9x 0.77	x	0.69	x	38.42	x	0.63	x	0.7	=	16.2	(76)
East	0.9x 0.77	x	2.8	x	63.27	x	0.63	x	0.7	=	54.14	(76)
East	0.9x 0.77	x	0.69	x	63.27	x	0.63	x	0.7	=	26.69	(76)
East	0.9x 0.77	x	2.8	x	92.28	x	0.63	x	0.7	=	78.97	(76)
East	0.9x 0.77	x	0.69	x	92.28	x	0.63	x	0.7	=	38.92	(76)
East	0.9x 0.77	x	2.8	x	113.09	x	0.63	x	0.7	=	96.78	(76)
East	0.9x 0.77	x	0.69	x	113.09	x	0.63	x	0.7	=	47.7	(76)
East	0.9x 0.77	x	2.8	x	115.77	x	0.63	x	0.7	=	99.07	(76)
East	0.9x 0.77	x	0.69	x	115.77	x	0.63	x	0.7	=	48.83	(76)
East	0.9x 0.77	x	2.8	x	110.22	x	0.63	x	0.7	=	94.32	(76)
East	0.9x 0.77	x	0.69	x	110.22	x	0.63	x	0.7	=	46.48	(76)
East	0.9x 0.77	x	2.8	x	94.68	x	0.63	x	0.7	=	81.02	(76)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	0.69	x	94.68	x	0.63	x	0.7	=	39.93	(76)
East	0.9x	0.77	x	2.8	x	73.59	x	0.63	x	0.7	=	62.97	(76)
East	0.9x	0.77	x	0.69	x	73.59	x	0.63	x	0.7	=	31.04	(76)
East	0.9x	0.77	x	2.8	x	45.59	x	0.63	x	0.7	=	39.01	(76)
East	0.9x	0.77	x	0.69	x	45.59	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	2.8	x	24.49	x	0.63	x	0.7	=	20.96	(76)
East	0.9x	0.77	x	0.69	x	24.49	x	0.63	x	0.7	=	10.33	(76)
East	0.9x	0.77	x	2.8	x	16.15	x	0.63	x	0.7	=	13.82	(76)
East	0.9x	0.77	x	0.69	x	16.15	x	0.63	x	0.7	=	6.81	(76)
South	0.9x	0.77	x	0.85	x	46.75	x	0.63	x	0.7	=	12.14	(78)
South	0.9x	0.77	x	0.85	x	76.57	x	0.63	x	0.7	=	19.89	(78)
South	0.9x	0.77	x	0.85	x	97.53	x	0.63	x	0.7	=	25.34	(78)
South	0.9x	0.77	x	0.85	x	110.23	x	0.63	x	0.7	=	28.64	(78)
South	0.9x	0.77	x	0.85	x	114.87	x	0.63	x	0.7	=	29.84	(78)
South	0.9x	0.77	x	0.85	x	110.55	x	0.63	x	0.7	=	28.72	(78)
South	0.9x	0.77	x	0.85	x	108.01	x	0.63	x	0.7	=	28.06	(78)
South	0.9x	0.77	x	0.85	x	104.89	x	0.63	x	0.7	=	27.25	(78)
South	0.9x	0.77	x	0.85	x	101.89	x	0.63	x	0.7	=	26.47	(78)
South	0.9x	0.77	x	0.85	x	82.59	x	0.63	x	0.7	=	21.45	(78)
South	0.9x	0.77	x	0.85	x	55.42	x	0.63	x	0.7	=	14.4	(78)
South	0.9x	0.77	x	0.85	x	40.4	x	0.63	x	0.7	=	10.49	(78)
West	0.9x	0.77	x	0.69	x	19.64	x	0.63	x	0.7	=	4.14	(80)
West	0.9x	0.77	x	0.85	x	19.64	x	0.63	x	0.7	=	5.1	(80)
West	0.9x	0.77	x	0.69	x	38.42	x	0.63	x	0.7	=	8.1	(80)
West	0.9x	0.77	x	0.85	x	38.42	x	0.63	x	0.7	=	9.98	(80)
West	0.9x	0.77	x	0.69	x	63.27	x	0.63	x	0.7	=	13.34	(80)
West	0.9x	0.77	x	0.85	x	63.27	x	0.63	x	0.7	=	16.44	(80)
West	0.9x	0.77	x	0.69	x	92.28	x	0.63	x	0.7	=	19.46	(80)
West	0.9x	0.77	x	0.85	x	92.28	x	0.63	x	0.7	=	23.97	(80)
West	0.9x	0.77	x	0.69	x	113.09	x	0.63	x	0.7	=	23.85	(80)
West	0.9x	0.77	x	0.85	x	113.09	x	0.63	x	0.7	=	29.38	(80)
West	0.9x	0.77	x	0.69	x	115.77	x	0.63	x	0.7	=	24.41	(80)
West	0.9x	0.77	x	0.85	x	115.77	x	0.63	x	0.7	=	30.07	(80)
West	0.9x	0.77	x	0.69	x	110.22	x	0.63	x	0.7	=	23.24	(80)
West	0.9x	0.77	x	0.85	x	110.22	x	0.63	x	0.7	=	28.63	(80)
West	0.9x	0.77	x	0.69	x	94.68	x	0.63	x	0.7	=	19.96	(80)
West	0.9x	0.77	x	0.85	x	94.68	x	0.63	x	0.7	=	24.59	(80)
West	0.9x	0.77	x	0.69	x	73.59	x	0.63	x	0.7	=	15.52	(80)
West	0.9x	0.77	x	0.85	x	73.59	x	0.63	x	0.7	=	19.12	(80)
West	0.9x	0.77	x	0.69	x	45.59	x	0.63	x	0.7	=	9.61	(80)
West	0.9x	0.77	x	0.85	x	45.59	x	0.63	x	0.7	=	11.84	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	0.69	x	24.49	x	0.63	x	0.7	=	5.16	(80)
West	0.9x	0.77	x	0.85	x	24.49	x	0.63	x	0.7	=	6.36	(80)
West	0.9x	0.77	x	0.69	x	16.15	x	0.63	x	0.7	=	3.41	(80)
West	0.9x	0.77	x	0.85	x	16.15	x	0.63	x	0.7	=	4.2	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.54	119.66	191.35	278.94	347.42	359.43	340.55	287.81	221.72	139.96	78.25	52.95	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	403.91	458.29	519.58	590.51	642.29	638.01	608.42	560.7	503.06	438.14	395.78	384.78	(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=	0.99	0.99	0.97	0.9	0.74	0.54	0.39	0.44	0.71	0.94	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.08	20.23	20.47	20.76	20.94	20.99	21	21	20.96	20.72	20.35	20.05	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.08	20.08	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.09	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.96	0.87	0.68	0.47	0.31	0.36	0.63	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=	18.86	19.08	19.43	19.83	20.04	20.09	20.1	20.1	20.07	19.78	19.26	18.82	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.35	19.55	19.85	20.2	20.4	20.46	20.46	20.46	20.43	20.16	19.7	19.32	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.35	19.55	19.85	20.2	20.4	20.46	20.46	20.46	20.43	20.16	19.7	19.32	(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	0.7	0.5	0.35	0.39	0.66	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	400.47	450.3	496.6	515.03	452.15	316.72	210.61	220.87	332.72	401.49	388.65	382.21	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	840.71	816.25	742.76	623.23	478.84	319.81	210.93	221.52	346.76	526.26	695.71	837.92	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	327.53	245.92	183.15	77.91	19.86	0	0	0	0	92.83	221.08	339.05	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1507.33 (98)

Space heating requirement in kWh/m²/year 27.06 (99)

TER WorkSheet: New dwelling design stage

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)													
	327.53	245.92	183.15	77.91	19.86	0	0	0	0	92.83	221.08	339.05	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	350.3	263.01	195.88	83.32	21.24	0	0	0	0	99.28	236.45	362.62	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1612.12 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98

Efficiency of water heater 79.8 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	86.43	86.02	85.1	83.19	80.95	79.8	79.8	79.8	79.8	83.52	85.65	86.58

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	204.79	181.61	193.37	178.13	180	164.03	158.37	172.63	171.96	183.94	188.67	199.79

Total = Sum(219a)$_{1...12}$ = 2177.29 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1612.12
Water heating fuel used		2177.29
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	75 (231)
Electricity for lighting		255.56 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4119.96 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	348.22	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	470.29	(264)

TER WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			818.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	132.64	(268)
Total CO2, kg/year	sum of (265)…(271) =			990.07	(272)

TER = 25.86 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:39

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 55.7m²
Site Reference : 43LS **Plot Reference:** FLAT 20
Address : FLAT 20, 43 London Street, Reading, RG1 4PS

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)	25.86 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.83 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.2 kWh/m²	
		Fail

Excess energy = 3.01 kg/m² (07.3 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.22 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	0.94 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	6.92m²
Windows facing: North	11.3m²
Windows facing: South	2.1m²
Windows facing: North	1.71m²
Windows facing: East	3.42m²
Windows facing: West	1.71m²
Windows facing: West	2.1m²
Ventilation rate:	5.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 20

Address : FLAT 20, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7 (1a)	x	2.3 (2a)	=	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.11	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.92	x	1/[1/(0.92)+ 0.04]	=	6.14			(27)
Windows Type 2			5.65	x	1/[1/(0.92)+ 0.04]	=	5.01			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 5			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 6			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 7			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Walls Type1	52.21	29.26	22.95	x	0.16	=	3.67	14	321.3	(29)
Walls Type2	16.56	2.1	14.46	x	0.14	=	2.02	14	202.44	(29)
Walls Type3	3.68	0	3.68	x	0.22	=	0.81	14	51.52	(29)
Total area of elements, m²			72.45							(31)
Party wall			15.87	x	0	=	0	20	317.4	(32)
Party floor			55.7					30	1671	(32a)
Party ceiling			55.7					20	1114	(32b)
Internal wall **			99.36					9	894.24	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 35 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4571.9 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 82.08 (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 — 10.87 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 45.87 (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=	15.3	15.11	14.93	14	13.82	12.89	12.89	12.71	13.26	13.82	14.19	14.56	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.16	60.98	60.79	59.87	59.69	58.76	58.76	58.58	59.13	59.69	60.06	60.43	

Average = Sum(39)$_{1...12}$ /12= 59.82 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.1	1.09	1.09	1.07	1.07	1.05	1.05	1.05	1.06	1.07	1.08	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 — 1.86 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 78.32 (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=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Total = Sum(44)$_{1...12}$ = 939.88 (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = 1232.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

DER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	(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=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Output from water heater (annual)$_{1...12}$	1397.9	(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=	42.48	37.16	38.34	33.43	32.07	27.68	25.65	29.43	29.78	34.71	37.89	41.14	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.44	12.83	10.43	7.9	5.9	4.98	5.39	7	9.4	11.93	13.92	14.84	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	161.99	163.67	159.43	150.42	139.03	128.33	121.19	119.5	123.74	132.76	144.14	154.84	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	57.1	55.29	51.53	46.43	43.11	38.44	34.47	39.56	41.36	46.65	52.62	55.3	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	292.08	290.34	279.95	263.29	246.6	230.31	219.6	224.62	233.05	249.89	269.24	283.54	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.65	x	10.63	x	0.51	x	0.8	=	33.97	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	5.65	x	20.32	x	0.51	x	0.8	=	64.93	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	5.65	x	34.53	x	0.51	x	0.8	=	110.32	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	5.65	x	55.46	x	0.51	x	0.8	=	177.21	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	5.65	x	74.72	x	0.51	x	0.8	=	238.72	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	5.65	x	79.99	x	0.51	x	0.8	=	255.55	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	5.65	x	74.68	x	0.51	x	0.8	=	238.59	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	5.65	x	59.25	x	0.51	x	0.8	=	189.29	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	5.65	x	41.52	x	0.51	x	0.8	=	132.65	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	5.65	x	24.19	x	0.51	x	0.8	=	77.29	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	5.65	x	13.12	x	0.51	x	0.8	=	41.91	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	5.65	x	8.86	x	0.51	x	0.8	=	28.32	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	6.92	x	19.64	x	0.51	x	0.8	=	38.43	(76)
East	0.9x 0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	20.53	(76)
East	0.9x 0.77	x	6.92	x	38.42	x	0.51	x	0.8	=	75.17	(76)
East	0.9x 0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	40.16	(76)
East	0.9x 0.77	x	6.92	x	63.27	x	0.51	x	0.8	=	123.8	(76)
East	0.9x 0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	66.13	(76)
East	0.9x 0.77	x	6.92	x	92.28	x	0.51	x	0.8	=	180.55	(76)
East	0.9x 0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	96.45	(76)
East	0.9x 0.77	x	6.92	x	113.09	x	0.51	x	0.8	=	221.28	(76)
East	0.9x 0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	118.2	(76)
East	0.9x 0.77	x	6.92	x	115.77	x	0.51	x	0.8	=	226.52	(76)
East	0.9x 0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	121	(76)
East	0.9x 0.77	x	6.92	x	110.22	x	0.51	x	0.8	=	215.65	(76)
East	0.9x 0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	115.2	(76)
East	0.9x 0.77	x	6.92	x	94.68	x	0.51	x	0.8	=	185.24	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	98.95	(76)
East	0.9x	0.77	x	6.92	x	73.59	x	0.51	x	0.8	=	143.98	(76)
East	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	76.92	(76)
East	0.9x	0.77	x	6.92	x	45.59	x	0.51	x	0.8	=	89.2	(76)
East	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	47.65	(76)
East	0.9x	0.77	x	6.92	x	24.49	x	0.51	x	0.8	=	47.92	(76)
East	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	25.6	(76)
East	0.9x	0.77	x	6.92	x	16.15	x	0.51	x	0.8	=	31.6	(76)
East	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	16.88	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
West	0.9x	0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	10.26	(80)
West	0.9x	0.77	x	2.1	x	19.64	x	0.63	x	0.7	=	12.6	(80)
West	0.9x	0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	20.08	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.63	x	0.7	=	24.66	(80)
West	0.9x	0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	33.07	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	48.23	(80)
West	0.9x	0.77	x	2.1	x	92.28	x	0.63	x	0.7	=	59.22	(80)
West	0.9x	0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	59.1	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.63	x	0.7	=	72.58	(80)
West	0.9x	0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	60.5	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.63	x	0.7	=	74.3	(80)
West	0.9x	0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	57.6	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.63	x	0.7	=	70.74	(80)
West	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	49.48	(80)
West	0.9x	0.77	x	2.1	x	94.68	x	0.63	x	0.7	=	60.76	(80)
West	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	38.46	(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.63	x	0.7	=	47.23	(80)
West	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	23.82	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.63	x	0.7	=	29.26	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	12.8	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.63	x	0.7	=	15.72	(80)
West	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	8.44	(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.63	x	0.7	=	10.37	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.36	284.75	454.57	661.4	822.65	850.62	806.13	682.01	526.32	332.86	186.36	126.17	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	443.44	575.09	734.52	924.69	1069.25	1080.93	1025.72	906.63	759.37	582.75	455.6	409.71	(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=	0.92	0.86	0.77	0.62	0.46	0.33	0.25	0.29	0.48	0.73	0.88	0.93	(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=	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=	0.91	0.85	0.75	0.6	0.44	0.31	0.22	0.26	0.45	0.71	0.87	0.92	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)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	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.67	20.67	20.67	20.68	20.68	20.69	20.69	20.69	20.68	20.68	20.68	20.68	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.67	20.67	20.67	20.68	20.68	20.69	20.69	20.69	20.68	20.68	20.68	20.68	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.91	0.86	0.76	0.61	0.45	0.32	0.23	0.27	0.46	0.72	0.87	0.93	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	405.61	493.04	557.66	561.04	480.46	341.15	234.72	243.13	347.73	418.82	398.29	379.64	(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=	1001.44	961.88	861.75	705.25	536.01	357.59	240.07	251.09	389.29	601.67	815.47	995.6	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	443.29	315.06	226.24	103.83	41.33	0	0	0	0	136.04	300.37	458.27	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 2024.45 (98)

Space heating requirement in kWh/m²/year 36.35 (99)

DER WorkSheet: New dwelling design stage

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		509.18 (206)
Efficiency of secondary/supplementary heating system, %		100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	443.29	315.06	226.24	103.83	41.33	0	0	0	0	136.04	300.37	458.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	87.06	61.88	44.43	20.39	8.12	0	0	0	0	26.72	58.99	90	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 397.59 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8

Efficiency of water heater 194.18 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	73.04	64.09	66.63	58.78	56.92	49.88	46.96	52.82	53.13	61	65.69	70.96

Total = Sum(219a)$_{1...12}$ = 719.9 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		397.59
Water heating fuel used		719.9
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	142.62	(230a)
warm air heating system fans	76.87	(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	219.48 (231)
Electricity for lighting		255.04 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1592.01 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year
Space heating (main system 1)	(211)	x	0.519	=	206.35 (261)
Space heating (secondary)	(215)	x	0.519	=	0 (263)
Water heating	(219)	x	0.519	=	373.63 (264)

DER WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			579.98	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	113.91	(267)
Electricity for lighting	(232) x	0.519	=	132.36	(268)
Total CO2, kg/year	sum of (265)…(271) =			826.25	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			14.83	(273)
EI rating (section 14)				89	(274)

Predicted Energy Assessment

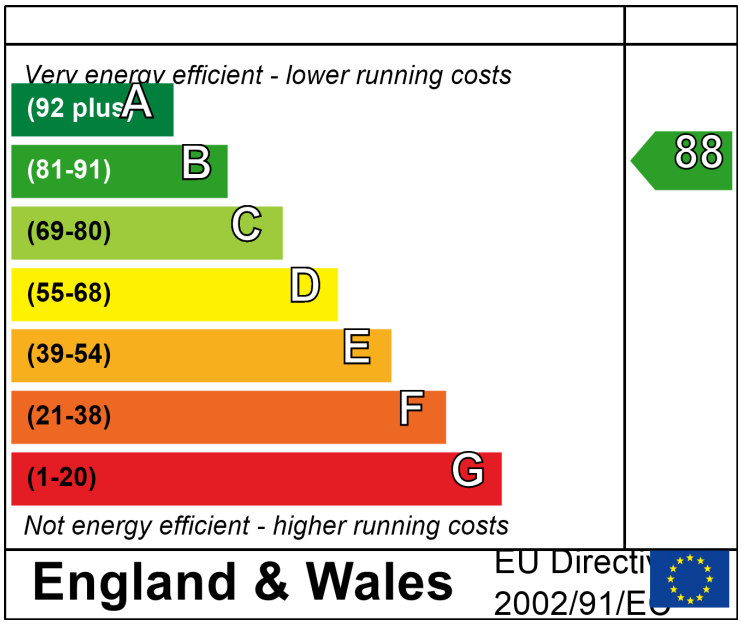
FLAT 20
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 55.7 m²

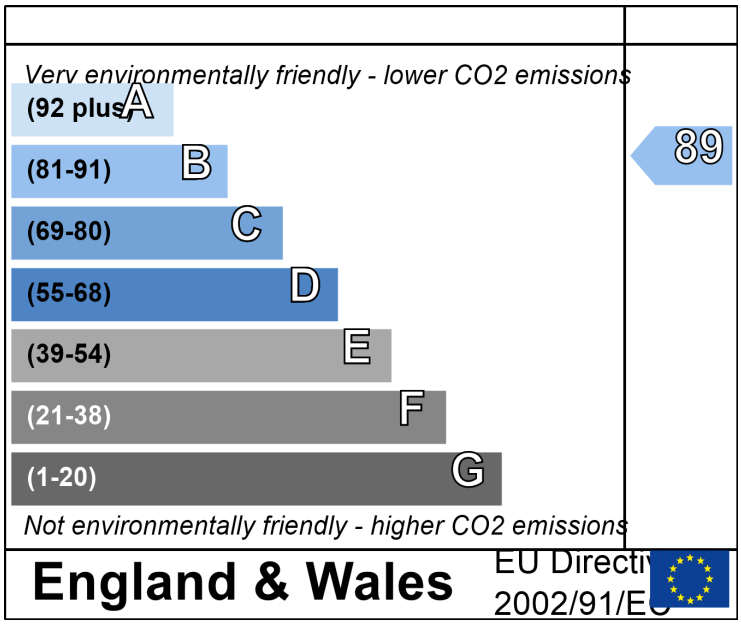
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 20

Address : FLAT 20, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7 (1a)	x	2.3 (2a)	=	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.11	(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			5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.18	(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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.92	x	1/[1/(0.92)+ 0.04]	=	6.14			(27)
Windows Type 2			5.65	x	1/[1/(0.92)+ 0.04]	=	5.01			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 5			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 6			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 7			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Walls Type1	52.21	29.26	22.95	x	0.16	=	3.67	14	321.3	(29)
Walls Type2	16.56	2.1	14.46	x	0.14	=	2.02	14	202.44	(29)
Walls Type3	3.68	0	3.68	x	0.22	=	0.81	14	51.52	(29)
Total area of elements, m²			72.45							(31)
Party wall			15.87	x	0	=	0	20	317.4	(32)
Party floor			55.7					30	1671	(32a)
Party ceiling			55.7					20	1114	(32b)
Internal wall **			99.36					9	894.24	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 35 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4571.9 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 82.08 (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 — 10.87 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 45.87 (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=	15.3	15.11	14.93	14	13.82	12.89	12.89	12.71	13.26	13.82	14.19	14.56	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.16	60.98	60.79	59.87	59.69	58.76	58.76	58.58	59.13	59.69	60.06	60.43	

Average = Sum(39)$_{1...12}$ /12= 59.82 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.1	1.09	1.09	1.07	1.07	1.05	1.05	1.05	1.06	1.07	1.08	1.08	

Average = Sum(40)$_{1...12}$ /12= 1.07 (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 — 1.86 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 78.32 (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=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Total = Sum(44)$_{1...12}$ = 939.88 (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = 1232.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0.54 (48)

Temperature factor from Table 2b — 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

SAP WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	(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=	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Output from water heater (annual)$_{1...12}$ 1397.9 (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=	42.48	37.16	38.34	33.43	32.07	27.68	25.65	29.43	29.78	34.71	37.89	41.14	(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=	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	111.47	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	36.1	32.07	26.08	19.74	14.76	12.46	13.46	17.5	23.49	29.82	34.81	37.11	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	241.77	244.28	237.96	224.5	207.51	191.54	180.87	178.37	184.69	198.15	215.14	231.1	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	48	48	48	48	48	48	48	48	48	48	48	48	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	57.1	55.29	51.53	46.43	43.11	38.44	34.47	39.56	41.36	46.65	52.62	55.3	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	427.82	424.49	408.42	383.52	358.23	335.29	321.66	328.27	342.39	367.47	395.41	416.36	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

SAP WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.65	x	10.63	x	0.51	x	0.8	=	33.97	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	5.65	x	20.32	x	0.51	x	0.8	=	64.93	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	5.65	x	34.53	x	0.51	x	0.8	=	110.32	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	5.65	x	55.46	x	0.51	x	0.8	=	177.21	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	5.65	x	74.72	x	0.51	x	0.8	=	238.72	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	5.65	x	79.99	x	0.51	x	0.8	=	255.55	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	5.65	x	74.68	x	0.51	x	0.8	=	238.59	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	5.65	x	59.25	x	0.51	x	0.8	=	189.29	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	5.65	x	41.52	x	0.51	x	0.8	=	132.65	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	5.65	x	24.19	x	0.51	x	0.8	=	77.29	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	5.65	x	13.12	x	0.51	x	0.8	=	41.91	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	5.65	x	8.86	x	0.51	x	0.8	=	28.32	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	6.92	x	19.64	x	0.51	x	0.8	=	38.43	(76)
East	0.9x 0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	20.53	(76)
East	0.9x 0.77	x	6.92	x	38.42	x	0.51	x	0.8	=	75.17	(76)
East	0.9x 0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	40.16	(76)
East	0.9x 0.77	x	6.92	x	63.27	x	0.51	x	0.8	=	123.8	(76)
East	0.9x 0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	66.13	(76)
East	0.9x 0.77	x	6.92	x	92.28	x	0.51	x	0.8	=	180.55	(76)
East	0.9x 0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	96.45	(76)
East	0.9x 0.77	x	6.92	x	113.09	x	0.51	x	0.8	=	221.28	(76)
East	0.9x 0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	118.2	(76)
East	0.9x 0.77	x	6.92	x	115.77	x	0.51	x	0.8	=	226.52	(76)
East	0.9x 0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	121	(76)
East	0.9x 0.77	x	6.92	x	110.22	x	0.51	x	0.8	=	215.65	(76)
East	0.9x 0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	115.2	(76)
East	0.9x 0.77	x	6.92	x	94.68	x	0.51	x	0.8	=	185.24	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	98.95	(76)
East	0.9x	0.77	x	6.92	x	73.59	x	0.51	x	0.8	=	143.98	(76)
East	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	76.92	(76)
East	0.9x	0.77	x	6.92	x	45.59	x	0.51	x	0.8	=	89.2	(76)
East	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	47.65	(76)
East	0.9x	0.77	x	6.92	x	24.49	x	0.51	x	0.8	=	47.92	(76)
East	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	25.6	(76)
East	0.9x	0.77	x	6.92	x	16.15	x	0.51	x	0.8	=	31.6	(76)
East	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	16.88	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
West	0.9x	0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	10.26	(80)
West	0.9x	0.77	x	2.1	x	19.64	x	0.63	x	0.7	=	12.6	(80)
West	0.9x	0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	20.08	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.63	x	0.7	=	24.66	(80)
West	0.9x	0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	33.07	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	48.23	(80)
West	0.9x	0.77	x	2.1	x	92.28	x	0.63	x	0.7	=	59.22	(80)
West	0.9x	0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	59.1	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.63	x	0.7	=	72.58	(80)
West	0.9x	0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	60.5	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.63	x	0.7	=	74.3	(80)
West	0.9x	0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	57.6	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.63	x	0.7	=	70.74	(80)
West	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	49.48	(80)
West	0.9x	0.77	x	2.1	x	94.68	x	0.63	x	0.7	=	60.76	(80)
West	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	38.46	(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.63	x	0.7	=	47.23	(80)
West	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	23.82	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.63	x	0.7	=	29.26	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	12.8	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.63	x	0.7	=	15.72	(80)
West	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	8.44	(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.63	x	0.7	=	10.37	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.36	284.75	454.57	661.4	822.65	850.62	806.13	682.01	526.32	332.86	186.36	126.17	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	579.18	709.24	862.99	1044.91	1180.88	1185.91	1127.78	1010.28	868.7	700.33	581.77	542.53	(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=	0.87	0.81	0.71	0.57	0.43	0.3	0.22	0.26	0.43	0.66	0.82	0.88	(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=	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=	0.86	0.8	0.7	0.55	0.41	0.28	0.2	0.23	0.4	0.64	0.81	0.88	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)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	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.67	20.67	20.67	20.68	20.68	20.69	20.69	20.69	20.68	20.68	20.68	20.68	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.67	20.67	20.67	20.68	20.68	20.69	20.69	20.69	20.68	20.68	20.68	20.68	(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=	0.86	0.8	0.7	0.56	0.41	0.29	0.21	0.24	0.41	0.65	0.81	0.88	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	500.69	569.5	608.18	585.12	489.56	343.99	235.72	244.77	356.71	456.68	473.71	476.72	(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=	1001.44	961.88	861.75	705.25	536.01	357.59	240.07	251.09	389.29	601.67	815.47	995.6	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	372.55	263.68	188.66	86.49	34.56	0	0	0	0	107.87	246.06	386.05	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1685.93 (98)

Space heating requirement in kWh/m²/year 30.27 (99)

SAP WorkSheet: New dwelling design stage

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		509.18 (206)
Efficiency of secondary/supplementary heating system, %		100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	372.55	263.68	188.66	86.49	34.56	0	0	0	0	107.87	246.06	386.05	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	73.17	51.79	37.05	16.99	6.79	0	0	0	0	21.18	48.32	75.82	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 331.1 (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)

	141.83	124.45	129.37	114.14	110.52	96.85	91.2	102.57	103.18	118.45	127.55	137.8	

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	73.04	64.09	66.63	58.78	56.92	49.88	46.96	52.82	53.13	61	65.69	70.96	

Total = Sum(219a)$_{1...12}$ = 719.9 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		331.1
Water heating fuel used		719.9
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	142.62	(230a)
warm air heating system fans	76.87	(230b)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	219.48 (231)
Electricity for lighting		255.04 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1525.53 (338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year
Space heating - main system 1	(211) x	13.19 x 0.01 =	43.67 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	13.19	x 0.01 =	94.95	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	28.95	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a					
Energy for lighting	(232)	13.19	x 0.01 =	33.64	(250)
Additional standing charges (Table 12)				0	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			201.22	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.84	(257)
SAP rating (Section 12)		88.29	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

		Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	171.84	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	373.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =				545.47	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	113.91	(267)
Electricity for lighting	(232) x		0.519	=	132.36	(268)
Total CO2, kg/year	sum of (265)…(271) =				791.75	(272)
CO2 emissions per m²	(272) ÷ (4) =				14.21	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	1016.49	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2210.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3226.58	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	673.82	(267)
Electricity for lighting	(232) x		0	=	782.97	(268)
'Total Primary Energy	sum of (265)…(271) =				4683.36	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				84.08	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 20

Address : FLAT 20, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.7 (1a)	x	2.3 (2a)	=	128.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	128.11	(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) =	0.16	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33

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=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			2.8	x1/[1/(1.4)+ 0.04]		=	3.71			(27)
Windows Type 2			2.28	x1/[1/(1.4)+ 0.04]		=	3.02			(27)
Windows Type 3			0.85	x1/[1/(1.4)+ 0.04]		=	1.13			(27)
Windows Type 4			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 5			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 6			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 7			0.85	x1/[1/(1.4)+ 0.04]		=	1.13			(27)
Walls Type1	52.21	11.82	40.39	x	0.18	=	7.27			(29)
Walls Type2	16.56	2.1	14.46	x	0.18	=	2.6			(29)
Walls Type3	3.68	0	3.68	x	0.18	=	0.66			(29)
Total area of elements, m²			72.45							(31)
Party wall			15.87	x	0	=	0			(32)
Party floor			55.7							(32a)
Party ceiling			55.7							(32b)
Internal wall **			99.36							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 28.31 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4816.06 (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

TER WorkSheet: New dwelling design stage

can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 3.62 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = — 31.93 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	23.92	23.81	23.7	23.21	23.11	22.68	22.68	22.6	22.85	23.11	23.3	23.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	55.84	55.74	55.63	55.13	55.04	54.61	54.61	54.53	54.77	55.04	55.23	55.43	

Average = Sum(39)$_{1...12}$ /12= 55.13 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1	1	1	0.99	0.99	0.98	0.98	0.98	0.98	0.99	0.99	1	

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 1.86 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 78.32 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	86.16	83.02	79.89	76.76	73.62	70.49	70.49	73.62	76.76	79.89	83.02	86.16	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 939.88 (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=	127.77	111.75	115.31	100.53	96.46	83.24	77.13	88.51	89.57	104.38	113.94	123.74	

Total = Sum(45)$_{1...12}$ = 1232.34 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.17	16.76	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56	(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): — 1.55 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = — 0.84 (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)

TER WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)	0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98	

Output from water heater (annual)$_{1...12}$ 1812.13 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	81.88	72.74	77.74	71.55	71.47	65.8	65.04	68.82	67.91	74.1	76.01	80.54	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	92.89	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.47	12.85	10.45	7.91	5.92	4.99	5.4	7.01	9.41	11.95	13.95	14.87	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	161.99	163.67	159.43	150.42	139.03	128.33	121.19	119.5	123.74	132.76	144.14	154.84	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	32.29	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	-74.31	(71)

Water heating gains (Table 5)

(72)m=	110.05	108.24	104.48	99.38	96.06	91.39	87.42	92.51	94.31	99.6	105.57	108.25	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	340.38	338.63	328.24	311.57	294.87	278.58	267.87	272.89	281.34	298.18	317.53	331.83	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	2.28	x	10.63	x	0.63	x	0.7	=	14.82	(74)
North	0.9x 0.77	x	0.69	x	10.63	x	0.63	x	0.7	=	2.24	(74)
North	0.9x 0.77	x	2.28	x	20.32	x	0.63	x	0.7	=	28.32	(74)
North	0.9x 0.77	x	0.69	x	20.32	x	0.63	x	0.7	=	4.29	(74)
North	0.9x 0.77	x	2.28	x	34.53	x	0.63	x	0.7	=	48.12	(74)
North	0.9x 0.77	x	0.69	x	34.53	x	0.63	x	0.7	=	7.28	(74)
North	0.9x 0.77	x	2.28	x	55.46	x	0.63	x	0.7	=	77.29	(74)
North	0.9x 0.77	x	0.69	x	55.46	x	0.63	x	0.7	=	11.7	(74)
North	0.9x 0.77	x	2.28	x	74.72	x	0.63	x	0.7	=	104.12	(74)
North	0.9x 0.77	x	0.69	x	74.72	x	0.63	x	0.7	=	15.76	(74)
North	0.9x 0.77	x	2.28	x	79.99	x	0.63	x	0.7	=	111.47	(74)
North	0.9x 0.77	x	0.69	x	79.99	x	0.63	x	0.7	=	16.87	(74)
North	0.9x 0.77	x	2.28	x	74.68	x	0.63	x	0.7	=	104.07	(74)
North	0.9x 0.77	x	0.69	x	74.68	x	0.63	x	0.7	=	15.75	(74)
North	0.9x 0.77	x	2.28	x	59.25	x	0.63	x	0.7	=	82.57	(74)
North	0.9x 0.77	x	0.69	x	59.25	x	0.63	x	0.7	=	12.49	(74)
North	0.9x 0.77	x	2.28	x	41.52	x	0.63	x	0.7	=	57.86	(74)
North	0.9x 0.77	x	0.69	x	41.52	x	0.63	x	0.7	=	8.75	(74)
North	0.9x 0.77	x	2.28	x	24.19	x	0.63	x	0.7	=	33.71	(74)
North	0.9x 0.77	x	0.69	x	24.19	x	0.63	x	0.7	=	5.1	(74)
North	0.9x 0.77	x	2.28	x	13.12	x	0.63	x	0.7	=	18.28	(74)
North	0.9x 0.77	x	0.69	x	13.12	x	0.63	x	0.7	=	2.77	(74)
North	0.9x 0.77	x	2.28	x	8.86	x	0.63	x	0.7	=	12.35	(74)
North	0.9x 0.77	x	0.69	x	8.86	x	0.63	x	0.7	=	1.87	(74)
East	0.9x 0.77	x	2.8	x	19.64	x	0.63	x	0.7	=	16.81	(76)
East	0.9x 0.77	x	0.69	x	19.64	x	0.63	x	0.7	=	8.28	(76)
East	0.9x 0.77	x	2.8	x	38.42	x	0.63	x	0.7	=	32.88	(76)
East	0.9x 0.77	x	0.69	x	38.42	x	0.63	x	0.7	=	16.2	(76)
East	0.9x 0.77	x	2.8	x	63.27	x	0.63	x	0.7	=	54.14	(76)
East	0.9x 0.77	x	0.69	x	63.27	x	0.63	x	0.7	=	26.69	(76)
East	0.9x 0.77	x	2.8	x	92.28	x	0.63	x	0.7	=	78.97	(76)
East	0.9x 0.77	x	0.69	x	92.28	x	0.63	x	0.7	=	38.92	(76)
East	0.9x 0.77	x	2.8	x	113.09	x	0.63	x	0.7	=	96.78	(76)
East	0.9x 0.77	x	0.69	x	113.09	x	0.63	x	0.7	=	47.7	(76)
East	0.9x 0.77	x	2.8	x	115.77	x	0.63	x	0.7	=	99.07	(76)
East	0.9x 0.77	x	0.69	x	115.77	x	0.63	x	0.7	=	48.83	(76)
East	0.9x 0.77	x	2.8	x	110.22	x	0.63	x	0.7	=	94.32	(76)
East	0.9x 0.77	x	0.69	x	110.22	x	0.63	x	0.7	=	46.48	(76)
East	0.9x 0.77	x	2.8	x	94.68	x	0.63	x	0.7	=	81.02	(76)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	0.69	x	94.68	x	0.63	x	0.7	=	39.93	(76)
East	0.9x	0.77	x	2.8	x	73.59	x	0.63	x	0.7	=	62.97	(76)
East	0.9x	0.77	x	0.69	x	73.59	x	0.63	x	0.7	=	31.04	(76)
East	0.9x	0.77	x	2.8	x	45.59	x	0.63	x	0.7	=	39.01	(76)
East	0.9x	0.77	x	0.69	x	45.59	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	2.8	x	24.49	x	0.63	x	0.7	=	20.96	(76)
East	0.9x	0.77	x	0.69	x	24.49	x	0.63	x	0.7	=	10.33	(76)
East	0.9x	0.77	x	2.8	x	16.15	x	0.63	x	0.7	=	13.82	(76)
East	0.9x	0.77	x	0.69	x	16.15	x	0.63	x	0.7	=	6.81	(76)
South	0.9x	0.77	x	0.85	x	46.75	x	0.63	x	0.7	=	12.14	(78)
South	0.9x	0.77	x	0.85	x	76.57	x	0.63	x	0.7	=	19.89	(78)
South	0.9x	0.77	x	0.85	x	97.53	x	0.63	x	0.7	=	25.34	(78)
South	0.9x	0.77	x	0.85	x	110.23	x	0.63	x	0.7	=	28.64	(78)
South	0.9x	0.77	x	0.85	x	114.87	x	0.63	x	0.7	=	29.84	(78)
South	0.9x	0.77	x	0.85	x	110.55	x	0.63	x	0.7	=	28.72	(78)
South	0.9x	0.77	x	0.85	x	108.01	x	0.63	x	0.7	=	28.06	(78)
South	0.9x	0.77	x	0.85	x	104.89	x	0.63	x	0.7	=	27.25	(78)
South	0.9x	0.77	x	0.85	x	101.89	x	0.63	x	0.7	=	26.47	(78)
South	0.9x	0.77	x	0.85	x	82.59	x	0.63	x	0.7	=	21.45	(78)
South	0.9x	0.77	x	0.85	x	55.42	x	0.63	x	0.7	=	14.4	(78)
South	0.9x	0.77	x	0.85	x	40.4	x	0.63	x	0.7	=	10.49	(78)
West	0.9x	0.77	x	0.69	x	19.64	x	0.63	x	0.7	=	4.14	(80)
West	0.9x	0.77	x	0.85	x	19.64	x	0.63	x	0.7	=	5.1	(80)
West	0.9x	0.77	x	0.69	x	38.42	x	0.63	x	0.7	=	8.1	(80)
West	0.9x	0.77	x	0.85	x	38.42	x	0.63	x	0.7	=	9.98	(80)
West	0.9x	0.77	x	0.69	x	63.27	x	0.63	x	0.7	=	13.34	(80)
West	0.9x	0.77	x	0.85	x	63.27	x	0.63	x	0.7	=	16.44	(80)
West	0.9x	0.77	x	0.69	x	92.28	x	0.63	x	0.7	=	19.46	(80)
West	0.9x	0.77	x	0.85	x	92.28	x	0.63	x	0.7	=	23.97	(80)
West	0.9x	0.77	x	0.69	x	113.09	x	0.63	x	0.7	=	23.85	(80)
West	0.9x	0.77	x	0.85	x	113.09	x	0.63	x	0.7	=	29.38	(80)
West	0.9x	0.77	x	0.69	x	115.77	x	0.63	x	0.7	=	24.41	(80)
West	0.9x	0.77	x	0.85	x	115.77	x	0.63	x	0.7	=	30.07	(80)
West	0.9x	0.77	x	0.69	x	110.22	x	0.63	x	0.7	=	23.24	(80)
West	0.9x	0.77	x	0.85	x	110.22	x	0.63	x	0.7	=	28.63	(80)
West	0.9x	0.77	x	0.69	x	94.68	x	0.63	x	0.7	=	19.96	(80)
West	0.9x	0.77	x	0.85	x	94.68	x	0.63	x	0.7	=	24.59	(80)
West	0.9x	0.77	x	0.69	x	73.59	x	0.63	x	0.7	=	15.52	(80)
West	0.9x	0.77	x	0.85	x	73.59	x	0.63	x	0.7	=	19.12	(80)
West	0.9x	0.77	x	0.69	x	45.59	x	0.63	x	0.7	=	9.61	(80)
West	0.9x	0.77	x	0.85	x	45.59	x	0.63	x	0.7	=	11.84	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	0.69	x	24.49	x	0.63	x	0.7	=	5.16	(80)
West	0.9x	0.77	x	0.85	x	24.49	x	0.63	x	0.7	=	6.36	(80)
West	0.9x	0.77	x	0.69	x	16.15	x	0.63	x	0.7	=	3.41	(80)
West	0.9x	0.77	x	0.85	x	16.15	x	0.63	x	0.7	=	4.2	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.54	119.66	191.35	278.94	347.42	359.43	340.55	287.81	221.72	139.96	78.25	52.95	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	403.91	458.29	519.58	590.51	642.29	638.01	608.42	560.7	503.06	438.14	395.78	384.78	(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=	0.99	0.99	0.97	0.9	0.74	0.54	0.39	0.44	0.71	0.94	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.08	20.23	20.47	20.76	20.94	20.99	21	21	20.96	20.72	20.35	20.05	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.08	20.08	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.09	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.96	0.87	0.68	0.47	0.31	0.36	0.63	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=	18.86	19.08	19.43	19.83	20.04	20.09	20.1	20.1	20.07	19.78	19.26	18.82	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.35	19.55	19.85	20.2	20.4	20.46	20.46	20.46	20.43	20.16	19.7	19.32	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.35	19.55	19.85	20.2	20.4	20.46	20.46	20.46	20.43	20.16	19.7	19.32	(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	0.7	0.5	0.35	0.39	0.66	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	400.47	450.3	496.6	515.03	452.15	316.72	210.61	220.87	332.72	401.49	388.65	382.21	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	840.71	816.25	742.76	623.23	478.84	319.81	210.93	221.52	346.76	526.26	695.71	837.92	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	327.53	245.92	183.15	77.91	19.86	0	0	0	0	92.83	221.08	339.05	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1507.33 (98)

Space heating requirement in kWh/m²/year 27.06 (99)

TER WorkSheet: New dwelling design stage

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)													
	327.53	245.92	183.15	77.91	19.86	0	0	0	0	92.83	221.08	339.05	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	350.3	263.01	195.88	83.32	21.24	0	0	0	0	99.28	236.45	362.62	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1612.12 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	177.01	156.22	164.55	148.19	145.7	130.89	126.38	137.75	137.22	153.63	161.6	172.98

Efficiency of water heater 79.8 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	86.43	86.02	85.1	83.19	80.95	79.8	79.8	79.8	79.8	83.52	85.65	86.58

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	204.79	181.61	193.37	178.13	180	164.03	158.37	172.63	171.96	183.94	188.67	199.79

Total = Sum(219a)$_{1...12}$ = 2177.29 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1612.12
Water heating fuel used		2177.29
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	75 (231)
Electricity for lighting		255.56 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4119.96 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	348.22	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	470.29	(264)

TER WorkSheet: New dwelling design stage

Space and water heating	(261) + (262) + (263) + (264) =			818.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	132.64	(268)
Total CO2, kg/year	sum of (265)…(271) =			990.07	(272)

TER = 25.86 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:37

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 55.6m²

Site Reference : 43LS **Plot Reference:** FLAT 21

Address : FLAT 21, 43 London Street, Reading, RG1 4PS

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)	29.66 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.02 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.22 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.09 (max. 0.20)	0.09 (max. 0.35)	**OK**
Openings	0.94 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.73	
Maximum	1.5	**OK**
MVHR efficiency:	85%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	6.93m²
Windows facing: North	11.32m²
Windows facing: South	2.1m²
Windows facing: North	1.71m²
Windows facing: East	3.42m²
Windows facing: West	1.71m²
Windows facing: West	2.1m²
Ventilation rate:	5.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	0.92 W/m²K
Doors U-value	0.33 W/m²K
Roofs U-value	0.09 W/m²K
Party Walls U-value	0 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 21

Address : FLAT 21, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.6	(1a) x	2.3	(2a) =	127.88	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.6	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.88	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.93	x	1/[1/(0.92)+ 0.04]	=	6.15			(27)
Windows Type 2			5.66	x	1/[1/(0.92)+ 0.04]	=	5.02			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 5			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 6			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 7			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Walls Type1	52.21	29.29	22.92	x	0.16	=	3.67	14	320.88	(29)
Walls Type2	16.56	2.1	14.46	x	0.14	=	2.02	14	202.44	(29)
Walls Type3	3.68	0	3.68	x	0.22	=	0.81	14	51.52	(29)
Roof	36.6	0	36.6	x	0.09	=	3.29	9	329.4	(30)
Total area of elements, m²			109.05							(31)
Party wall			15.87	x	0	=	0	20	317.4	(32)
Party floor			55.6					30	1668	(32a)
Party ceiling			19					20	380	(32b)
Internal wall **			99.36					9	894.24	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 38.31 (33)

DER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4163.88 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 74.89 (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 16.92 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 55.23 (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=	15.27	15.09	14.9	13.98	13.79	12.87	12.87	12.69	13.24	13.79	14.16	14.53	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	70.5	70.32	70.13	69.21	69.02	68.1	68.1	67.92	68.47	69.02	69.39	69.76	

Average = Sum(39)$_{1...12}$ /12= 69.16 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.27	1.26	1.26	1.24	1.24	1.22	1.22	1.22	1.23	1.24	1.25	1.25	

Average = Sum(40)$_{1...12}$ /12= 1.24 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.85 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 78.25 (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=	86.08	82.95	79.82	76.69	73.56	70.43	70.43	73.56	76.69	79.82	82.95	86.08	

Total = Sum(44)$_{1...12}$ = 939.05 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	127.65	111.65	115.21	100.44	96.38	83.17	77.07	88.43	89.49	104.29	113.84	123.63	

Total = Sum(45)$_{1...12}$ = 1231.24 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.15	16.75	17.28	15.07	14.46	12.47	11.56	13.27	13.42	15.64	17.08	18.54	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

DER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	141.72	124.35	129.27	114.05	110.44	96.77	91.13	102.5	103.1	118.35	127.45	137.69	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	141.72	124.35	129.27	114.05	110.44	96.77	91.13	102.5	103.1	118.35	127.45	137.69	

Output from water heater (annual)$_{1...12}$ 1396.81 (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=	42.44	37.12	38.31	33.4	32.05	27.65	25.62	29.4	29.76	34.68	37.85	41.11	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.42	12.81	10.41	7.88	5.89	4.98	5.38	6.99	9.38	11.91	13.9	14.82	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	161.73	163.41	159.18	150.18	138.81	128.13	120.99	119.32	123.54	132.55	143.91	154.59	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	(71)

Water heating gains (Table 5)

(72)m=	57.05	55.24	51.49	46.38	43.07	38.41	34.44	39.52	41.33	46.61	52.57	55.25	(72)

DER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	291.69	289.95	279.58	262.94	246.27	230.01	219.31	224.32	232.75	249.56	268.88	283.16	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.66	x	10.63	x	0.51	x	0.8	=	34.03	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	5.66	x	20.32	x	0.51	x	0.8	=	65.04	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	5.66	x	34.53	x	0.51	x	0.8	=	110.52	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	5.66	x	55.46	x	0.51	x	0.8	=	177.52	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	5.66	x	74.72	x	0.51	x	0.8	=	239.14	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	5.66	x	79.99	x	0.51	x	0.8	=	256.01	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	5.66	x	74.68	x	0.51	x	0.8	=	239.01	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	5.66	x	59.25	x	0.51	x	0.8	=	189.63	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	5.66	x	41.52	x	0.51	x	0.8	=	132.88	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	5.66	x	24.19	x	0.51	x	0.8	=	77.42	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	5.66	x	13.12	x	0.51	x	0.8	=	41.99	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	5.66	x	8.86	x	0.51	x	0.8	=	28.37	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	6.93	x	19.64	x	0.51	x	0.8	=	38.48	(76)
East	0.9x 0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	20.53	(76)
East	0.9x 0.77	x	6.93	x	38.42	x	0.51	x	0.8	=	75.28	(76)
East	0.9x 0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	40.16	(76)
East	0.9x 0.77	x	6.93	x	63.27	x	0.51	x	0.8	=	123.98	(76)
East	0.9x 0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	66.13	(76)
East	0.9x 0.77	x	6.93	x	92.28	x	0.51	x	0.8	=	180.82	(76)
East	0.9x 0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	96.45	(76)
East	0.9x 0.77	x	6.93	x	113.09	x	0.51	x	0.8	=	221.6	(76)
East	0.9x 0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	118.2	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	6.93	x	115.77	x	0.51	x	0.8	=	226.84	(76)
East	0.9x	0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	121	(76)
East	0.9x	0.77	x	6.93	x	110.22	x	0.51	x	0.8	=	215.96	(76)
East	0.9x	0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	115.2	(76)
East	0.9x	0.77	x	6.93	x	94.68	x	0.51	x	0.8	=	185.51	(76)
East	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	98.95	(76)
East	0.9x	0.77	x	6.93	x	73.59	x	0.51	x	0.8	=	144.19	(76)
East	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	76.92	(76)
East	0.9x	0.77	x	6.93	x	45.59	x	0.51	x	0.8	=	89.33	(76)
East	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	47.65	(76)
East	0.9x	0.77	x	6.93	x	24.49	x	0.51	x	0.8	=	47.98	(76)
East	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	25.6	(76)
East	0.9x	0.77	x	6.93	x	16.15	x	0.51	x	0.8	=	31.65	(76)
East	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	16.88	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
West	0.9x	0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	10.26	(80)
West	0.9x	0.77	x	2.1	x	19.64	x	0.63	x	0.7	=	12.6	(80)
West	0.9x	0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	20.08	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.63	x	0.7	=	24.66	(80)
West	0.9x	0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	33.07	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	48.23	(80)
West	0.9x	0.77	x	2.1	x	92.28	x	0.63	x	0.7	=	59.22	(80)
West	0.9x	0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	59.1	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.63	x	0.7	=	72.58	(80)
West	0.9x	0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	60.5	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.63	x	0.7	=	74.3	(80)
West	0.9x	0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	57.6	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.63	x	0.7	=	70.74	(80)
West	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	49.48	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.1	x	94.68	x	0.63	x	0.7	=	60.76		(80)
West	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	38.46		(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.63	x	0.7	=	47.23		(80)
West	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	23.82		(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.63	x	0.7	=	29.26		(80)
West	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	12.8		(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.63	x	0.7	=	15.72		(80)
West	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	8.44		(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.63	x	0.7	=	10.37		(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.48	284.98	454.95	661.97	823.39	851.4	806.86	682.61	526.76	333.13	186.5	126.27	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	443.17	574.93	734.53	924.91	1069.67	1081.41	1026.17	906.94	759.51	582.69	455.39	409.43	(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=	0.92	0.86	0.78	0.64	0.5	0.37	0.28	0.32	0.51	0.75	0.88	0.93	(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=	20.37	20.37	20.37	20.38	20.38	20.39	20.39	20.39	20.38	20.38	20.38	20.37	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.91	0.86	0.77	0.63	0.47	0.34	0.24	0.28	0.48	0.73	0.87	0.92	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.37	20.37	20.37	20.38	20.38	20.39	20.39	20.39	20.38	20.38	20.38	20.37	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.62	20.62	20.62	20.63	20.63	20.64	20.64	20.64	20.63	20.63	20.63	20.63	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.62	20.62	20.62	20.63	20.63	20.64	20.64	20.64	20.63	20.63	20.63	20.63	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.91	0.86	0.77	0.63	0.48	0.35	0.26	0.3	0.49	0.74	0.88	0.92	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	404.18	494.22	566.82	586.08	517.32	376.99	262.49	270.32	373.58	428.61	398.48	378	(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=	1150.75	1105.62	990.58	811.78	616.41	411.02	274.81	287.72	447.34	692.34	938.78	1145.95	(97)

DER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	555.45	410.86	315.28	162.5	73.73	0	0	0	0	196.21	389.02	571.36

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2674.4 (98)

Space heating requirement in kWh/m²/year 48.1 (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 1 511.08 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	555.45	410.86	315.28	162.5	73.73	0	0	0	0	196.21	389.02	571.36	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	108.68	80.39	61.69	31.8	14.43	0	0	0	0	38.39	76.12	111.79	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 523.29 (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

Output from water heater (calculated above)

	141.72	124.35	129.27	114.05	110.44	96.77	91.13	102.5	103.1	118.35	127.45	137.69

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	72.98	64.04	66.57	58.73	56.87	49.84	46.93	52.78	53.09	60.95	65.64	70.91

Total = Sum(219a)$_{1...12}$ = 719.34 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 523.29

Water heating fuel used 719.34

Electricity for pumps, fans and electric keep-hot

mechanical ventilation - balanced, extract or positive input from outside 142.36 (230a)

warm air heating system fans 76.73 (230b)

Total electricity for the above, kWh/year sum of (230a)…(230g) = 219.09 (231)

Electricity for lighting 254.63 (232)

Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) = 1716.35 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

DER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	271.59	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	373.34	(264)
Space and water heating	(261) + (262) + (263) + (264) =				644.92	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	113.71	(267)
Electricity for lighting	(232) x		0.519	=	132.15	(268)
Total CO2, kg/year		sum of (265)…(271) =			890.78	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			16.02	(273)
EI rating (section 14)					88	(274)

Predicted Energy Assessment

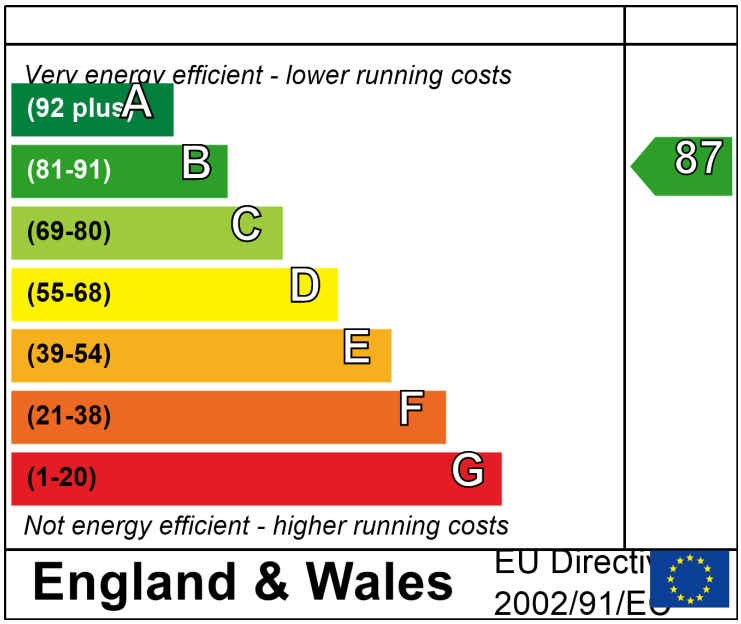
FLAT 21
43 London Street
Reading
RG1 4PS

Dwelling type: Mid floor Flat
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 55.6 m²

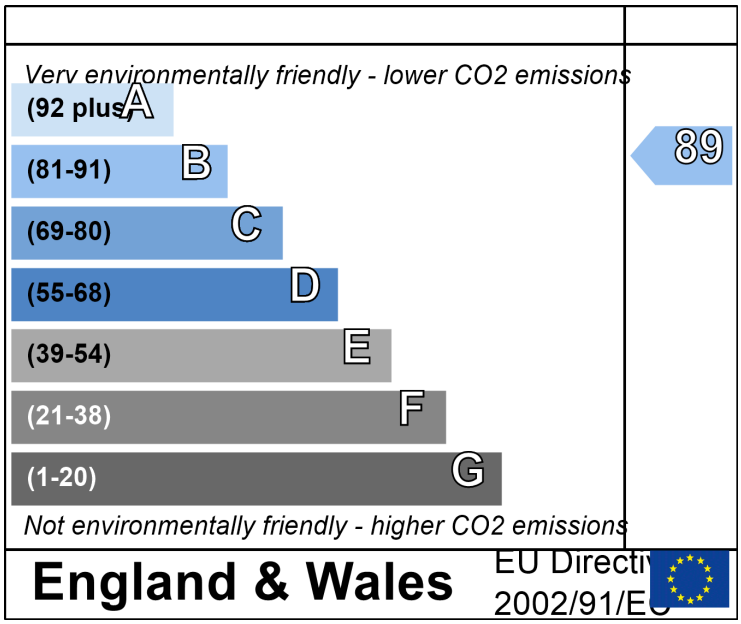
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 21

Address : FLAT 21, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.6	(1a) x	2.3	(2a) =	127.88	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.6	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.88	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				
Number of sides sheltered				4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.7 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =			0.18 (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

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21

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) = 72.25 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(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=	0.36	0.36	0.35	0.33	0.33	0.3	0.3	0.3	0.31	0.33	0.34	0.34	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			6.93	x	1/[1/(0.92)+ 0.04]	=	6.15			(27)
Windows Type 2			5.66	x	1/[1/(0.92)+ 0.04]	=	5.02			(27)
Windows Type 3			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Windows Type 4			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 5			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 6			1.71	x	1/[1/(1.1)+ 0.04]	=	1.8			(27)
Windows Type 7			2.1	x	1/[1/(1.1)+ 0.04]	=	2.21			(27)
Walls Type1	52.21	29.29	22.92	x	0.16	=	3.67	14	320.88	(29)
Walls Type2	16.56	2.1	14.46	x	0.14	=	2.02	14	202.44	(29)
Walls Type3	3.68	0	3.68	x	0.22	=	0.81	14	51.52	(29)
Roof	36.6	0	36.6	x	0.09	=	3.29	9	329.4	(30)
Total area of elements, m²			109.05							(31)
Party wall			15.87	x	0	=	0	20	317.4	(32)
Party floor			55.6					30	1668	(32a)
Party ceiling			19					20	380	(32b)
Internal wall **			99.36					9	894.24	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 38.31 (33)

SAP WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4163.88 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 74.89 (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 16.92 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 55.23 (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=	15.27	15.09	14.9	13.98	13.79	12.87	12.87	12.69	13.24	13.79	14.16	14.53	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	70.5	70.32	70.13	69.21	69.02	68.1	68.1	67.92	68.47	69.02	69.39	69.76	

Average = Sum(39)$_{1...12}$ /12= 69.16 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.27	1.26	1.26	1.24	1.24	1.22	1.22	1.22	1.23	1.24	1.25	1.25	

Average = Sum(40)$_{1...12}$ /12= 1.24 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.85 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 78.25 (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=	86.08	82.95	79.82	76.69	73.56	70.43	70.43	73.56	76.69	79.82	82.95	86.08	

Total = Sum(44)$_{1...12}$ = 939.05 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	127.65	111.65	115.21	100.44	96.38	83.17	77.07	88.43	89.49	104.29	113.84	123.63	

Total = Sum(45)$_{1...12}$ = 1231.24 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.15	16.75	17.28	15.07	14.46	12.47	11.56	13.27	13.42	15.64	17.08	18.54	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.54 (48)

Temperature factor from Table 2b 0.4536 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

b) If manufacturer's declared cylinder loss factor is not known:

SAP WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	141.72	124.35	129.27	114.05	110.44	96.77	91.13	102.5	103.1	118.35	127.45	137.69	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	141.72	124.35	129.27	114.05	110.44	96.77	91.13	102.5	103.1	118.35	127.45	137.69	

Output from water heater (annual)$_{1...12}$ 1396.81 (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=	42.44	37.12	38.31	33.4	32.05	27.65	25.62	29.4	29.76	34.68	37.85	41.11	(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=	111.3	111.3	111.3	111.3	111.3	111.3	111.3	111.3	111.3	111.3	111.3	111.3	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	36.05	32.02	26.04	19.71	14.73	12.44	13.44	17.47	23.45	29.78	34.75	37.05	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	241.39	243.89	237.58	224.14	207.18	191.24	180.59	178.08	184.39	197.83	214.8	230.74	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	47.98	47.98	47.98	47.98	47.98	47.98	47.98	47.98	47.98	47.98	47.98	47.98	(69)

Pumps and fans gains (Table 5a)

(70)m=	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	7.67	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	(71)

Water heating gains (Table 5)

(72)m=	57.05	55.24	51.49	46.38	43.07	38.41	34.44	39.52	41.33	46.61	52.57	55.25	(72)

SAP WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	427.24	423.91	407.86	383	357.74	334.84	321.23	327.83	341.93	366.97	394.88	415.79

(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	5.66	x	10.63	x	0.51	x	0.8	=	34.03	(74)
North	0.9x 0.77	x	1.71	x	10.63	x	0.63	x	0.7	=	5.56	(74)
North	0.9x 0.77	x	5.66	x	20.32	x	0.51	x	0.8	=	65.04	(74)
North	0.9x 0.77	x	1.71	x	20.32	x	0.63	x	0.7	=	10.62	(74)
North	0.9x 0.77	x	5.66	x	34.53	x	0.51	x	0.8	=	110.52	(74)
North	0.9x 0.77	x	1.71	x	34.53	x	0.63	x	0.7	=	18.05	(74)
North	0.9x 0.77	x	5.66	x	55.46	x	0.51	x	0.8	=	177.52	(74)
North	0.9x 0.77	x	1.71	x	55.46	x	0.63	x	0.7	=	28.99	(74)
North	0.9x 0.77	x	5.66	x	74.72	x	0.51	x	0.8	=	239.14	(74)
North	0.9x 0.77	x	1.71	x	74.72	x	0.63	x	0.7	=	39.05	(74)
North	0.9x 0.77	x	5.66	x	79.99	x	0.51	x	0.8	=	256.01	(74)
North	0.9x 0.77	x	1.71	x	79.99	x	0.63	x	0.7	=	41.8	(74)
North	0.9x 0.77	x	5.66	x	74.68	x	0.51	x	0.8	=	239.01	(74)
North	0.9x 0.77	x	1.71	x	74.68	x	0.63	x	0.7	=	39.03	(74)
North	0.9x 0.77	x	5.66	x	59.25	x	0.51	x	0.8	=	189.63	(74)
North	0.9x 0.77	x	1.71	x	59.25	x	0.63	x	0.7	=	30.96	(74)
North	0.9x 0.77	x	5.66	x	41.52	x	0.51	x	0.8	=	132.88	(74)
North	0.9x 0.77	x	1.71	x	41.52	x	0.63	x	0.7	=	21.7	(74)
North	0.9x 0.77	x	5.66	x	24.19	x	0.51	x	0.8	=	77.42	(74)
North	0.9x 0.77	x	1.71	x	24.19	x	0.63	x	0.7	=	12.64	(74)
North	0.9x 0.77	x	5.66	x	13.12	x	0.51	x	0.8	=	41.99	(74)
North	0.9x 0.77	x	1.71	x	13.12	x	0.63	x	0.7	=	6.86	(74)
North	0.9x 0.77	x	5.66	x	8.86	x	0.51	x	0.8	=	28.37	(74)
North	0.9x 0.77	x	1.71	x	8.86	x	0.63	x	0.7	=	4.63	(74)
East	0.9x 0.77	x	6.93	x	19.64	x	0.51	x	0.8	=	38.48	(76)
East	0.9x 0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	20.53	(76)
East	0.9x 0.77	x	6.93	x	38.42	x	0.51	x	0.8	=	75.28	(76)
East	0.9x 0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	40.16	(76)
East	0.9x 0.77	x	6.93	x	63.27	x	0.51	x	0.8	=	123.98	(76)
East	0.9x 0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	66.13	(76)
East	0.9x 0.77	x	6.93	x	92.28	x	0.51	x	0.8	=	180.82	(76)
East	0.9x 0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	96.45	(76)
East	0.9x 0.77	x	6.93	x	113.09	x	0.51	x	0.8	=	221.6	(76)
East	0.9x 0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	118.2	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	6.93	x	115.77	x	0.51	x	0.8	=	226.84	(76)
East	0.9x	0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	121	(76)
East	0.9x	0.77	x	6.93	x	110.22	x	0.51	x	0.8	=	215.96	(76)
East	0.9x	0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	115.2	(76)
East	0.9x	0.77	x	6.93	x	94.68	x	0.51	x	0.8	=	185.51	(76)
East	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	98.95	(76)
East	0.9x	0.77	x	6.93	x	73.59	x	0.51	x	0.8	=	144.19	(76)
East	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	76.92	(76)
East	0.9x	0.77	x	6.93	x	45.59	x	0.51	x	0.8	=	89.33	(76)
East	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	47.65	(76)
East	0.9x	0.77	x	6.93	x	24.49	x	0.51	x	0.8	=	47.98	(76)
East	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	25.6	(76)
East	0.9x	0.77	x	6.93	x	16.15	x	0.51	x	0.8	=	31.65	(76)
East	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	16.88	(76)
South	0.9x	0.77	x	2.1	x	46.75	x	0.63	x	0.7	=	30	(78)
South	0.9x	0.77	x	2.1	x	76.57	x	0.63	x	0.7	=	49.14	(78)
South	0.9x	0.77	x	2.1	x	97.53	x	0.63	x	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.1	x	110.23	x	0.63	x	0.7	=	70.75	(78)
South	0.9x	0.77	x	2.1	x	114.87	x	0.63	x	0.7	=	73.72	(78)
South	0.9x	0.77	x	2.1	x	110.55	x	0.63	x	0.7	=	70.95	(78)
South	0.9x	0.77	x	2.1	x	108.01	x	0.63	x	0.7	=	69.32	(78)
South	0.9x	0.77	x	2.1	x	104.89	x	0.63	x	0.7	=	67.32	(78)
South	0.9x	0.77	x	2.1	x	101.89	x	0.63	x	0.7	=	65.39	(78)
South	0.9x	0.77	x	2.1	x	82.59	x	0.63	x	0.7	=	53	(78)
South	0.9x	0.77	x	2.1	x	55.42	x	0.63	x	0.7	=	35.57	(78)
South	0.9x	0.77	x	2.1	x	40.4	x	0.63	x	0.7	=	25.93	(78)
West	0.9x	0.77	x	1.71	x	19.64	x	0.63	x	0.7	=	10.26	(80)
West	0.9x	0.77	x	2.1	x	19.64	x	0.63	x	0.7	=	12.6	(80)
West	0.9x	0.77	x	1.71	x	38.42	x	0.63	x	0.7	=	20.08	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.63	x	0.7	=	24.66	(80)
West	0.9x	0.77	x	1.71	x	63.27	x	0.63	x	0.7	=	33.07	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.63	x	0.7	=	40.61	(80)
West	0.9x	0.77	x	1.71	x	92.28	x	0.63	x	0.7	=	48.23	(80)
West	0.9x	0.77	x	2.1	x	92.28	x	0.63	x	0.7	=	59.22	(80)
West	0.9x	0.77	x	1.71	x	113.09	x	0.63	x	0.7	=	59.1	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.63	x	0.7	=	72.58	(80)
West	0.9x	0.77	x	1.71	x	115.77	x	0.63	x	0.7	=	60.5	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.63	x	0.7	=	74.3	(80)
West	0.9x	0.77	x	1.71	x	110.22	x	0.63	x	0.7	=	57.6	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.63	x	0.7	=	70.74	(80)
West	0.9x	0.77	x	1.71	x	94.68	x	0.63	x	0.7	=	49.48	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.1	x	94.68	x	0.63	x	0.7	=	60.76	(80)
West	0.9x	0.77	x	1.71	x	73.59	x	0.63	x	0.7	=	38.46	(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.63	x	0.7	=	47.23	(80)
West	0.9x	0.77	x	1.71	x	45.59	x	0.63	x	0.7	=	23.82	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.63	x	0.7	=	29.26	(80)
West	0.9x	0.77	x	1.71	x	24.49	x	0.63	x	0.7	=	12.8	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.63	x	0.7	=	15.72	(80)
West	0.9x	0.77	x	1.71	x	16.15	x	0.63	x	0.7	=	8.44	(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.63	x	0.7	=	10.37	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	151.48	284.98	454.95	661.97	823.39	851.4	806.86	682.61	526.76	333.13	186.5	126.27	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	578.72	708.88	862.81	1044.97	1181.13	1186.24	1128.09	1010.44	868.69	700.1	581.38	542.06	(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=	0.87	0.82	0.73	0.6	0.46	0.34	0.25	0.29	0.46	0.69	0.83	0.88	(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=	20.37	20.37	20.37	20.38	20.38	20.39	20.39	20.39	20.38	20.38	20.38	20.37	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.86	0.81	0.72	0.58	0.44	0.31	0.22	0.26	0.43	0.67	0.82	0.88	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.37	20.37	20.37	20.38	20.38	20.39	20.39	20.39	20.38	20.38	20.38	20.37	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.62	20.62	20.62	20.63	20.63	20.64	20.64	20.64	20.63	20.63	20.63	20.63	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.62	20.62	20.62	20.63	20.63	20.64	20.64	20.64	20.63	20.63	20.63	20.63	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.87	0.81	0.72	0.59	0.45	0.32	0.23	0.27	0.45	0.68	0.82	0.88	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	501.26	574.87	623.64	616.71	530.75	381.94	264.46	273.36	386.82	472.85	477.5	476.58	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1150.75	1105.62	990.58	811.78	616.41	411.02	274.81	287.72	447.34	692.34	938.78	1145.95	(97)

SAP WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	483.22	356.66	273	140.45	63.74	0	0	0	0	163.3	332.12	498.01

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2310.5 (98)

Space heating requirement in kWh/m²/year 41.56 (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 1 511.08 (206)

Efficiency of secondary/supplementary heating system, % 100 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	483.22	356.66	273	140.45	63.74	0	0	0	0	163.3	332.12	498.01	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	94.55	69.79	53.42	27.48	12.47	0	0	0	0	31.95	64.98	97.44	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 452.08 (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)

	141.72	124.35	129.27	114.05	110.44	96.77	91.13	102.5	103.1	118.35	127.45	137.69

Efficiency of water heater 194.18 (216)

(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	72.98	64.04	66.57	58.73	56.87	49.84	46.93	52.78	53.09	60.95	65.64	70.91

Total = Sum(219a)$_{1...12}$ = 719.34 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		452.08
Water heating fuel used		719.34
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	142.36	(230a)
warm air heating system fans	76.73	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		219.09 (231)
Electricity for lighting		254.63 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1645.15 (338)

10a. Fuel costs - individual heating systems:

SAP WorkSheet: New dwelling design stage

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		13.19	x 0.01 =	59.63	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	94.88	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	28.9	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	33.59	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				216.99	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	0.91	(257)
SAP rating (Section 12)	87.36	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	234.63	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	373.34	(264)
Space and water heating	(261) + (262) + (263) + (264) =				607.97	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	113.71	(267)
Electricity for lighting	(232) x		0.519	=	132.15	(268)
Total CO2, kg/year	sum of (265)…(271) =				853.83	(272)
CO2 emissions per m²	(272) ÷ (4) =				15.36	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		3.07	=	1387.9	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	2208.36	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3596.26	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	672.61	(267)

SAP WorkSheet: New dwelling design stage

Electricity for lighting	(232) x	0	=	781.72	(268)
'Total Primary Energy		sum of (265)…(271) =		5050.6	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		90.84	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 21

Address : FLAT 21, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	55.6 (1a)	x	2.3 (2a)	=	127.88	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	55.6 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	127.88	(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) =	0.16	(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			4	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7	(20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.28	0.31	0.32	0.33

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=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			2.79	x1/[1/(1.4)+ 0.04]		=	3.7			(27)
Windows Type 2			2.28	x1/[1/(1.4)+ 0.04]		=	3.02			(27)
Windows Type 3			0.85	x1/[1/(1.4)+ 0.04]		=	1.13			(27)
Windows Type 4			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 5			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 6			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 7			0.85	x1/[1/(1.4)+ 0.04]		=	1.13			(27)
Walls Type1	52.21	11.81	40.4	x	0.18	=	7.27			(29)
Walls Type2	16.56	2.1	14.46	x	0.18	=	2.6			(29)
Walls Type3	3.68	0	3.68	x	0.18	=	0.66			(29)
Roof	36.6	0	36.6	x	0.13	=	4.76			(30)
Total area of elements, m²			109.05							(31)
Party wall			15.87	x	0	=	0			(32)
Party floor			55.6							(32a)
Party ceiling			19							(32b)
Internal wall **			99.36							(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 33.05 (33)

TER WorkSheet: New dwelling design stage

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4408.6 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.68 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 42.73 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	23.88	23.77	23.66	23.17	23.07	22.64	22.64	22.56	22.81	23.07	23.26	23.46	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	66.6	66.5	66.39	65.89	65.8	65.37	65.37	65.29	65.54	65.8	65.99	66.19	

Average = Sum(39)$_{1...12}$ /12= 65.89 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.2	1.2	1.19	1.19	1.18	1.18	1.18	1.17	1.18	1.18	1.19	1.19	

Average = Sum(40)$_{1...12}$ /12= 1.19 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.85 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 78.25 (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=	86.08	82.95	79.82	76.69	73.56	70.43	70.43	73.56	76.69	79.82	82.95	86.08	

Total = Sum(44)$_{1...12}$ = 939.05 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	127.65	111.65	115.21	100.44	96.38	83.17	77.07	88.43	89.49	104.29	113.84	123.63	

Total = Sum(45)$_{1...12}$ = 1231.24 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.15	16.75	17.28	15.07	14.46	12.47	11.56	13.27	13.42	15.64	17.08	18.54	(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): 1.55 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.84 (50)

b) If manufacturer's declared cylinder loss factor is not known:

TER WorkSheet: New dwelling design stage

Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	176.9	156.12	164.45	148.1	145.62	130.82	126.31	137.68	137.14	153.53	161.5	172.87	(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=	176.9	156.12	164.45	148.1	145.62	130.82	126.31	137.68	137.14	153.53	161.5	172.87	

Output from water heater (annual)$_{1...12}$ 1811.04 (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=	81.84	72.7	77.7	71.52	71.44	65.78	65.02	68.8	67.88	74.07	75.98	80.5	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	92.75	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.45	12.83	10.44	7.9	5.91	4.99	5.39	7	9.4	11.93	13.93	14.85	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	161.73	163.41	159.18	150.18	138.81	128.13	120.99	119.32	123.54	132.55	143.91	154.59	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	32.27	(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=	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	-74.2	(71)

Water heating gains (Table 5)

(72)m=	110	108.19	104.44	99.33	96.02	91.36	87.39	92.47	94.28	99.56	105.52	108.2	(72)

TER WorkSheet: New dwelling design stage

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	340	338.26	327.88	311.23	294.56	278.29	267.59	272.61	281.04	297.86	317.19	331.47

(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	2.28	x	10.63	x	0.63	x	0.7	=	14.82	(74)
North	0.9x 0.77	x	0.69	x	10.63	x	0.63	x	0.7	=	2.24	(74)
North	0.9x 0.77	x	2.28	x	20.32	x	0.63	x	0.7	=	28.32	(74)
North	0.9x 0.77	x	0.69	x	20.32	x	0.63	x	0.7	=	4.29	(74)
North	0.9x 0.77	x	2.28	x	34.53	x	0.63	x	0.7	=	48.12	(74)
North	0.9x 0.77	x	0.69	x	34.53	x	0.63	x	0.7	=	7.28	(74)
North	0.9x 0.77	x	2.28	x	55.46	x	0.63	x	0.7	=	77.29	(74)
North	0.9x 0.77	x	0.69	x	55.46	x	0.63	x	0.7	=	11.7	(74)
North	0.9x 0.77	x	2.28	x	74.72	x	0.63	x	0.7	=	104.12	(74)
North	0.9x 0.77	x	0.69	x	74.72	x	0.63	x	0.7	=	15.76	(74)
North	0.9x 0.77	x	2.28	x	79.99	x	0.63	x	0.7	=	111.47	(74)
North	0.9x 0.77	x	0.69	x	79.99	x	0.63	x	0.7	=	16.87	(74)
North	0.9x 0.77	x	2.28	x	74.68	x	0.63	x	0.7	=	104.07	(74)
North	0.9x 0.77	x	0.69	x	74.68	x	0.63	x	0.7	=	15.75	(74)
North	0.9x 0.77	x	2.28	x	59.25	x	0.63	x	0.7	=	82.57	(74)
North	0.9x 0.77	x	0.69	x	59.25	x	0.63	x	0.7	=	12.49	(74)
North	0.9x 0.77	x	2.28	x	41.52	x	0.63	x	0.7	=	57.86	(74)
North	0.9x 0.77	x	0.69	x	41.52	x	0.63	x	0.7	=	8.75	(74)
North	0.9x 0.77	x	2.28	x	24.19	x	0.63	x	0.7	=	33.71	(74)
North	0.9x 0.77	x	0.69	x	24.19	x	0.63	x	0.7	=	5.1	(74)
North	0.9x 0.77	x	2.28	x	13.12	x	0.63	x	0.7	=	18.28	(74)
North	0.9x 0.77	x	0.69	x	13.12	x	0.63	x	0.7	=	2.77	(74)
North	0.9x 0.77	x	2.28	x	8.86	x	0.63	x	0.7	=	12.35	(74)
North	0.9x 0.77	x	0.69	x	8.86	x	0.63	x	0.7	=	1.87	(74)
East	0.9x 0.77	x	2.79	x	19.64	x	0.63	x	0.7	=	16.75	(76)
East	0.9x 0.77	x	0.69	x	19.64	x	0.63	x	0.7	=	8.28	(76)
East	0.9x 0.77	x	2.79	x	38.42	x	0.63	x	0.7	=	32.76	(76)
East	0.9x 0.77	x	0.69	x	38.42	x	0.63	x	0.7	=	16.2	(76)
East	0.9x 0.77	x	2.79	x	63.27	x	0.63	x	0.7	=	53.95	(76)
East	0.9x 0.77	x	0.69	x	63.27	x	0.63	x	0.7	=	26.69	(76)
East	0.9x 0.77	x	2.79	x	92.28	x	0.63	x	0.7	=	78.68	(76)
East	0.9x 0.77	x	0.69	x	92.28	x	0.63	x	0.7	=	38.92	(76)
East	0.9x 0.77	x	2.79	x	113.09	x	0.63	x	0.7	=	96.43	(76)
East	0.9x 0.77	x	0.69	x	113.09	x	0.63	x	0.7	=	47.7	(76)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	2.79	x	115.77	x	0.63	x	0.7	=	98.71	(76)
East	0.9x	0.77	x	0.69	x	115.77	x	0.63	x	0.7	=	48.83	(76)
East	0.9x	0.77	x	2.79	x	110.22	x	0.63	x	0.7	=	93.98	(76)
East	0.9x	0.77	x	0.69	x	110.22	x	0.63	x	0.7	=	46.48	(76)
East	0.9x	0.77	x	2.79	x	94.68	x	0.63	x	0.7	=	80.73	(76)
East	0.9x	0.77	x	0.69	x	94.68	x	0.63	x	0.7	=	39.93	(76)
East	0.9x	0.77	x	2.79	x	73.59	x	0.63	x	0.7	=	62.75	(76)
East	0.9x	0.77	x	0.69	x	73.59	x	0.63	x	0.7	=	31.04	(76)
East	0.9x	0.77	x	2.79	x	45.59	x	0.63	x	0.7	=	38.87	(76)
East	0.9x	0.77	x	0.69	x	45.59	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	2.79	x	24.49	x	0.63	x	0.7	=	20.88	(76)
East	0.9x	0.77	x	0.69	x	24.49	x	0.63	x	0.7	=	10.33	(76)
East	0.9x	0.77	x	2.79	x	16.15	x	0.63	x	0.7	=	13.77	(76)
East	0.9x	0.77	x	0.69	x	16.15	x	0.63	x	0.7	=	6.81	(76)
South	0.9x	0.77	x	0.85	x	46.75	x	0.63	x	0.7	=	12.14	(78)
South	0.9x	0.77	x	0.85	x	76.57	x	0.63	x	0.7	=	19.89	(78)
South	0.9x	0.77	x	0.85	x	97.53	x	0.63	x	0.7	=	25.34	(78)
South	0.9x	0.77	x	0.85	x	110.23	x	0.63	x	0.7	=	28.64	(78)
South	0.9x	0.77	x	0.85	x	114.87	x	0.63	x	0.7	=	29.84	(78)
South	0.9x	0.77	x	0.85	x	110.55	x	0.63	x	0.7	=	28.72	(78)
South	0.9x	0.77	x	0.85	x	108.01	x	0.63	x	0.7	=	28.06	(78)
South	0.9x	0.77	x	0.85	x	104.89	x	0.63	x	0.7	=	27.25	(78)
South	0.9x	0.77	x	0.85	x	101.89	x	0.63	x	0.7	=	26.47	(78)
South	0.9x	0.77	x	0.85	x	82.59	x	0.63	x	0.7	=	21.45	(78)
South	0.9x	0.77	x	0.85	x	55.42	x	0.63	x	0.7	=	14.4	(78)
South	0.9x	0.77	x	0.85	x	40.4	x	0.63	x	0.7	=	10.49	(78)
West	0.9x	0.77	x	0.69	x	19.64	x	0.63	x	0.7	=	4.14	(80)
West	0.9x	0.77	x	0.85	x	19.64	x	0.63	x	0.7	=	5.1	(80)
West	0.9x	0.77	x	0.69	x	38.42	x	0.63	x	0.7	=	8.1	(80)
West	0.9x	0.77	x	0.85	x	38.42	x	0.63	x	0.7	=	9.98	(80)
West	0.9x	0.77	x	0.69	x	63.27	x	0.63	x	0.7	=	13.34	(80)
West	0.9x	0.77	x	0.85	x	63.27	x	0.63	x	0.7	=	16.44	(80)
West	0.9x	0.77	x	0.69	x	92.28	x	0.63	x	0.7	=	19.46	(80)
West	0.9x	0.77	x	0.85	x	92.28	x	0.63	x	0.7	=	23.97	(80)
West	0.9x	0.77	x	0.69	x	113.09	x	0.63	x	0.7	=	23.85	(80)
West	0.9x	0.77	x	0.85	x	113.09	x	0.63	x	0.7	=	29.38	(80)
West	0.9x	0.77	x	0.69	x	115.77	x	0.63	x	0.7	=	24.41	(80)
West	0.9x	0.77	x	0.85	x	115.77	x	0.63	x	0.7	=	30.07	(80)
West	0.9x	0.77	x	0.69	x	110.22	x	0.63	x	0.7	=	23.24	(80)
West	0.9x	0.77	x	0.85	x	110.22	x	0.63	x	0.7	=	28.63	(80)
West	0.9x	0.77	x	0.69	x	94.68	x	0.63	x	0.7	=	19.96	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	0.85	x	94.68	x	0.63	x	0.7	=	24.59	(80)
West	0.9x	0.77	x	0.69	x	73.59	x	0.63	x	0.7	=	15.52	(80)
West	0.9x	0.77	x	0.85	x	73.59	x	0.63	x	0.7	=	19.12	(80)
West	0.9x	0.77	x	0.69	x	45.59	x	0.63	x	0.7	=	9.61	(80)
West	0.9x	0.77	x	0.85	x	45.59	x	0.63	x	0.7	=	11.84	(80)
West	0.9x	0.77	x	0.69	x	24.49	x	0.63	x	0.7	=	5.16	(80)
West	0.9x	0.77	x	0.85	x	24.49	x	0.63	x	0.7	=	6.36	(80)
West	0.9x	0.77	x	0.69	x	16.15	x	0.63	x	0.7	=	3.41	(80)
West	0.9x	0.77	x	0.85	x	16.15	x	0.63	x	0.7	=	4.2	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.48	119.54	191.15	278.66	347.07	359.08	340.21	287.52	221.5	139.82	78.18	52.9	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	403.48	457.8	519.03	589.89	641.63	637.37	607.81	560.13	502.54	437.68	395.37	384.37	(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	0.81	0.63	0.47	0.52	0.78	0.96	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.81	19.97	20.24	20.58	20.85	20.97	20.99	20.99	20.9	20.55	20.12	19.78	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.92	19.92	19.92	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.93	19.93	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.97	0.9	0.75	0.53	0.36	0.41	0.7	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=	18.35	18.58	18.97	19.46	19.79	19.92	19.94	19.94	19.86	19.43	18.81	18.31	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.94	19.14	19.48	19.91	20.22	20.34	20.36	20.36	20.28	19.89	19.34	18.9	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.94	19.14	19.48	19.91	20.22	20.34	20.36	20.36	20.28	19.89	19.34	18.9	(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	0.46	0.73	0.94	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	400.23	450.84	500.7	533.29	494.18	363.61	244.41	255.61	367.58	409.67	389.18	381.88	(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=	975.28	947.05	861.97	725.61	560.47	375.43	246.1	258.7	405.3	611.03	807.63	973.22	(97)

TER WorkSheet: New dwelling design stage

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	427.83	333.45	268.79	138.48	49.31	0	0	0	0	149.81	301.28	439.96

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2108.91 (98)

Space heating requirement in kWh/m²/year 37.93 (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)	427.83	333.45	268.79	138.48	49.31	0	0	0	0	149.81	301.28	439.96	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	457.58	356.63	287.47	148.1	52.74	0	0	0	0	160.22	322.23	470.54	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2255.52 (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)

	176.9	156.12	164.45	148.1	145.62	130.82	126.31	137.68	137.14	153.53	161.5	172.87

Efficiency of water heater 79.8 (216)

(217)m=	87.08	86.79	86.12	84.64	82.26	79.8	79.8	79.8	79.8	84.75	86.45	87.2

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	203.13	179.89	190.96	174.98	177.02	163.93	158.28	172.53	171.86	181.16	186.8	198.24

Total = Sum(219a)$_{1...12}$ = 2158.8 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2255.52
Water heating fuel used		2158.8
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		255.14 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4744.45 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

TER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	487.19	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	466.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =				953.49	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	132.42	(268)
Total CO2, kg/year		sum of (265)…(271) =			1124.83	(272)

TER = 29.66 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.60
Printed on 11 August 2025 at 20:27:34

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Maisonette

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 84.5m²

Site Reference : 43LS **Plot Reference:** FLAT 22

Address : FLAT 22, 43 London Street, Reading, RG1 4PS

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)	33.24 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.70 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	76.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	55.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.14 (max. 0.70)	**OK**
Floor	0.17 (max. 0.25)	0.17 (max. 0.70)	**OK**
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	**OK**
Openings	1.06 (max. 2.00)	1.10 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:
Heat pumps with warm air distribution - electric
Nilan Compact P

Secondary heating system: Room heaters - electric
Panel, convector or radiant heaters

5 Cylinder insulation

Hot water Storage: No Separate Cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostat	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	

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:	0.88	
Maximum	1.5	**OK**
MVHR efficiency:	86%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Very Little
Windows facing: South	1.42m²
Windows facing: South	1.56m²
Windows facing: West	2.86m²
Windows facing: South	1.46m²
Windows facing: South East	5.84m²
Windows facing: East	8.76m²
Windows facing: North East	5.84m²
Windows facing: North	1.46m²
Windows facing: South	1.56m²
Windows facing: South East	3.12m²
Windows facing: East	4.68m²
Windows facing: North East	3.12m²
Windows facing: North	0.78m²
Ventilation rate:	8.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 100% of daylight hours

10 Key features

Windows U-value	1.1 W/m²K
Doors U-value	0.33 W/m²K
Roofs U-value	0.11 W/m²K
External Walls U-value	0.12 W/m²K
Secondary heating (Electricity)	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 22

Address : FLAT 22, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46 (1a)	x	2.2 (2a)	=	101.2	(3a)
First floor	38.5 (1b)	x	2.7 (2b)	=	103.95	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	84.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	205.15	(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			5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.25 (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) =		0.21 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Monthly average wind speed from Table 7

(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

DER WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.27	0.27	0.26	0.23	0.23	0.2	0.2	0.2	0.21	0.23	0.24	0.25

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.41	0.4	0.39	0.37	0.36	0.34	0.34	0.33	0.35	0.36	0.37	0.38	(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=	0.41	0.4	0.39	0.37	0.36	0.34	0.34	0.33	0.35	0.36	0.37	0.38	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			0.71	x1/[1/(1.1)+ 0.04]		=	0.75			(27)
Windows Type 2			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 3			2.86	x1/[1/(1.1)+ 0.04]		=	3.01			(27)
Windows Type 4			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 5			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 6			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 7			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 8			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 9			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 10			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 11			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 12			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 13			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Floor			14.3	x	0.17	=	2.431	20	286	(28)
Walls Type1	128.87	42.46	86.41	x	0.12	=	10.37	14	1209.74	(29)
Walls Type2	13.86	2.1	11.76	x	0.14	=	1.65	14	164.64	(29)

DER WorkSheet: New dwelling design stage

Roof	56.5	0	56.5	x	0.11	=	6.21	9	508.5 (30)
Total area of elements, m²			213.53						(31)
Party floor			41.2					30	1236 (32a)
Internal wall **			202.04					9	1818.36 (32c)
Internal floor			28.3					18	509.4 (32d)
Internal ceiling			28.3					9	254.7 (32e)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 66.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5987.34 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 70.86 (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 26.63 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 92.72 (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=	27.45	27.09	26.73	24.93	24.57	22.77	22.77	22.41	23.49	24.57	25.29	26.01	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	120.17	119.81	119.45	117.65	117.29	115.49	115.49	115.13	116.21	117.29	118.01	118.73	

Average = Sum(39)$_{1...12}$ /12= 117.56 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.42	1.42	1.41	1.39	1.39	1.37	1.37	1.36	1.38	1.39	1.4	1.41	

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 2.54 (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 94.59 (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=	104.05	100.27	96.48	92.7	88.91	85.13	85.13	88.91	92.7	96.48	100.27	104.05	

Total = Sum(44)$_{1...12}$ = 1135.08 (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=	154.3	134.95	139.26	121.41	116.5	100.53	93.15	106.89	108.17	126.06	137.61	149.43	

Total = Sum(45)$_{1...12}$ = 1488.26 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.15	20.24	20.89	18.21	17.47	15.08	13.97	16.03	16.23	18.91	20.64	22.41	(46)

DER WorkSheet: New dwelling design stage

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel		180	(47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):		0.54	(48)
Temperature factor from Table 2b		0.4536	(49)
Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	168.36	147.65	153.32	135.02	130.56	114.13	107.21	120.96	121.78	140.12	151.22	163.49	(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=	168.36	147.65	153.32	135.02	130.56	114.13	107.21	120.96	121.78	140.12	151.22	163.49	

Output from water heater (annual)$_{1...12}$ 1653.83 (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=	51.31	44.87	46.3	40.37	38.73	33.43	30.97	35.54	35.97	41.92	45.75	49.69	(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=	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.38	18.1	14.72	11.14	8.33	7.03	7.6	9.88	13.26	16.83	19.65	20.95	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	228.59	230.96	224.98	212.26	196.19	181.1	171.01	168.64	174.62	187.34	203.4	218.5	(68)

DER WorkSheet: New dwelling design stage

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	(69)

Pumps and fans gains (Table 5a)

(70)m=	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	(71)

Water heating gains (Table 5)

(72)m=	68.96	66.77	62.24	56.07	52.06	46.42	41.63	47.77	49.95	56.34	63.55	66.78	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	391.38	389.28	375.39	352.92	330.04	308	293.69	299.74	311.28	333.96	360.05	379.68	(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	1.46	x	10.63	x	0.63	x	0.7	=	4.74	(74)
North	0.9x 0.77	x	0.78	x	10.63	x	0.63	x	0.7	=	2.53	(74)
North	0.9x 0.77	x	1.46	x	20.32	x	0.63	x	0.7	=	9.07	(74)
North	0.9x 0.77	x	0.78	x	20.32	x	0.63	x	0.7	=	4.84	(74)
North	0.9x 0.77	x	1.46	x	34.53	x	0.63	x	0.7	=	15.41	(74)
North	0.9x 0.77	x	0.78	x	34.53	x	0.63	x	0.7	=	8.23	(74)
North	0.9x 0.77	x	1.46	x	55.46	x	0.63	x	0.7	=	24.75	(74)
North	0.9x 0.77	x	0.78	x	55.46	x	0.63	x	0.7	=	13.22	(74)
North	0.9x 0.77	x	1.46	x	74.72	x	0.63	x	0.7	=	33.34	(74)
North	0.9x 0.77	x	0.78	x	74.72	x	0.63	x	0.7	=	17.81	(74)
North	0.9x 0.77	x	1.46	x	79.99	x	0.63	x	0.7	=	35.69	(74)
North	0.9x 0.77	x	0.78	x	79.99	x	0.63	x	0.7	=	19.07	(74)
North	0.9x 0.77	x	1.46	x	74.68	x	0.63	x	0.7	=	33.32	(74)
North	0.9x 0.77	x	0.78	x	74.68	x	0.63	x	0.7	=	17.8	(74)
North	0.9x 0.77	x	1.46	x	59.25	x	0.63	x	0.7	=	26.44	(74)
North	0.9x 0.77	x	0.78	x	59.25	x	0.63	x	0.7	=	14.12	(74)
North	0.9x 0.77	x	1.46	x	41.52	x	0.63	x	0.7	=	18.52	(74)
North	0.9x 0.77	x	0.78	x	41.52	x	0.63	x	0.7	=	9.9	(74)
North	0.9x 0.77	x	1.46	x	24.19	x	0.63	x	0.7	=	10.79	(74)
North	0.9x 0.77	x	0.78	x	24.19	x	0.63	x	0.7	=	5.77	(74)
North	0.9x 0.77	x	1.46	x	13.12	x	0.63	x	0.7	=	5.85	(74)
North	0.9x 0.77	x	0.78	x	13.12	x	0.63	x	0.7	=	3.13	(74)
North	0.9x 0.77	x	1.46	x	8.86	x	0.63	x	0.7	=	3.96	(74)
North	0.9x 0.77	x	0.78	x	8.86	x	0.63	x	0.7	=	2.11	(74)
Northeast	0.9x 0.77	x	1.46	x	11.28	x	0.63	x	0.7	=	20.14	(75)
Northeast	0.9x 0.77	x	0.78	x	11.28	x	0.63	x	0.7	=	10.76	(75)

DER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	1.46	x	22.97	x	0.63	x	0.7	=	40.99	(75)
Northeast	0.9x	0.77	x	0.78	x	22.97	x	0.63	x	0.7	=	21.9	(75)
Northeast	0.9x	0.77	x	1.46	x	41.38	x	0.63	x	0.7	=	73.85	(75)
Northeast	0.9x	0.77	x	0.78	x	41.38	x	0.63	x	0.7	=	39.46	(75)
Northeast	0.9x	0.77	x	1.46	x	67.96	x	0.63	x	0.7	=	121.29	(75)
Northeast	0.9x	0.77	x	0.78	x	67.96	x	0.63	x	0.7	=	64.8	(75)
Northeast	0.9x	0.77	x	1.46	x	91.35	x	0.63	x	0.7	=	163.03	(75)
Northeast	0.9x	0.77	x	0.78	x	91.35	x	0.63	x	0.7	=	87.1	(75)
Northeast	0.9x	0.77	x	1.46	x	97.38	x	0.63	x	0.7	=	173.81	(75)
Northeast	0.9x	0.77	x	0.78	x	97.38	x	0.63	x	0.7	=	92.86	(75)
Northeast	0.9x	0.77	x	1.46	x	91.1	x	0.63	x	0.7	=	162.6	(75)
Northeast	0.9x	0.77	x	0.78	x	91.1	x	0.63	x	0.7	=	86.87	(75)
Northeast	0.9x	0.77	x	1.46	x	72.63	x	0.63	x	0.7	=	129.62	(75)
Northeast	0.9x	0.77	x	0.78	x	72.63	x	0.63	x	0.7	=	69.25	(75)
Northeast	0.9x	0.77	x	1.46	x	50.42	x	0.63	x	0.7	=	89.99	(75)
Northeast	0.9x	0.77	x	0.78	x	50.42	x	0.63	x	0.7	=	48.08	(75)
Northeast	0.9x	0.77	x	1.46	x	28.07	x	0.63	x	0.7	=	50.09	(75)
Northeast	0.9x	0.77	x	0.78	x	28.07	x	0.63	x	0.7	=	26.76	(75)
Northeast	0.9x	0.77	x	1.46	x	14.2	x	0.63	x	0.7	=	25.34	(75)
Northeast	0.9x	0.77	x	0.78	x	14.2	x	0.63	x	0.7	=	13.54	(75)
Northeast	0.9x	0.77	x	1.46	x	9.21	x	0.63	x	0.7	=	16.45	(75)
Northeast	0.9x	0.77	x	0.78	x	9.21	x	0.63	x	0.7	=	8.79	(75)
East	0.9x	0.77	x	1.46	x	19.64	x	0.63	x	0.7	=	52.58	(76)
East	0.9x	0.77	x	0.78	x	19.64	x	0.63	x	0.7	=	28.09	(76)
East	0.9x	0.77	x	1.46	x	38.42	x	0.63	x	0.7	=	102.86	(76)
East	0.9x	0.77	x	0.78	x	38.42	x	0.63	x	0.7	=	54.95	(76)
East	0.9x	0.77	x	1.46	x	63.27	x	0.63	x	0.7	=	169.39	(76)
East	0.9x	0.77	x	0.78	x	63.27	x	0.63	x	0.7	=	90.5	(76)
East	0.9x	0.77	x	1.46	x	92.28	x	0.63	x	0.7	=	247.05	(76)
East	0.9x	0.77	x	0.78	x	92.28	x	0.63	x	0.7	=	131.99	(76)
East	0.9x	0.77	x	1.46	x	113.09	x	0.63	x	0.7	=	302.77	(76)
East	0.9x	0.77	x	0.78	x	113.09	x	0.63	x	0.7	=	161.75	(76)
East	0.9x	0.77	x	1.46	x	115.77	x	0.63	x	0.7	=	309.94	(76)
East	0.9x	0.77	x	0.78	x	115.77	x	0.63	x	0.7	=	165.58	(76)
East	0.9x	0.77	x	1.46	x	110.22	x	0.63	x	0.7	=	295.07	(76)
East	0.9x	0.77	x	0.78	x	110.22	x	0.63	x	0.7	=	157.64	(76)
East	0.9x	0.77	x	1.46	x	94.68	x	0.63	x	0.7	=	253.46	(76)
East	0.9x	0.77	x	0.78	x	94.68	x	0.63	x	0.7	=	135.41	(76)
East	0.9x	0.77	x	1.46	x	73.59	x	0.63	x	0.7	=	197.01	(76)
East	0.9x	0.77	x	0.78	x	73.59	x	0.63	x	0.7	=	105.25	(76)
East	0.9x	0.77	x	1.46	x	45.59	x	0.63	x	0.7	=	122.05	(76)

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	0.78	x	45.59	x	0.63	x	0.7	=	65.2	(76)
East	0.9x	0.77	x	1.46	x	24.49	x	0.63	x	0.7	=	65.56	(76)
East	0.9x	0.77	x	0.78	x	24.49	x	0.63	x	0.7	=	35.03	(76)
East	0.9x	0.77	x	1.46	x	16.15	x	0.63	x	0.7	=	43.24	(76)
East	0.9x	0.77	x	0.78	x	16.15	x	0.63	x	0.7	=	23.1	(76)
Southeast	0.9x	0.77	x	1.46	x	36.79	x	0.63	x	0.7	=	65.67	(77)
Southeast	0.9x	0.77	x	0.78	x	36.79	x	0.63	x	0.7	=	35.08	(77)
Southeast	0.9x	0.77	x	1.46	x	62.67	x	0.63	x	0.7	=	111.86	(77)
Southeast	0.9x	0.77	x	0.78	x	62.67	x	0.63	x	0.7	=	59.76	(77)
Southeast	0.9x	0.77	x	1.46	x	85.75	x	0.63	x	0.7	=	153.05	(77)
Southeast	0.9x	0.77	x	0.78	x	85.75	x	0.63	x	0.7	=	81.77	(77)
Southeast	0.9x	0.77	x	1.46	x	106.25	x	0.63	x	0.7	=	189.64	(77)
Southeast	0.9x	0.77	x	0.78	x	106.25	x	0.63	x	0.7	=	101.31	(77)
Southeast	0.9x	0.77	x	1.46	x	119.01	x	0.63	x	0.7	=	212.41	(77)
Southeast	0.9x	0.77	x	0.78	x	119.01	x	0.63	x	0.7	=	113.48	(77)
Southeast	0.9x	0.77	x	1.46	x	118.15	x	0.63	x	0.7	=	210.87	(77)
Southeast	0.9x	0.77	x	0.78	x	118.15	x	0.63	x	0.7	=	112.66	(77)
Southeast	0.9x	0.77	x	1.46	x	113.91	x	0.63	x	0.7	=	203.3	(77)
Southeast	0.9x	0.77	x	0.78	x	113.91	x	0.63	x	0.7	=	108.61	(77)
Southeast	0.9x	0.77	x	1.46	x	104.39	x	0.63	x	0.7	=	186.31	(77)
Southeast	0.9x	0.77	x	0.78	x	104.39	x	0.63	x	0.7	=	99.54	(77)
Southeast	0.9x	0.77	x	1.46	x	92.85	x	0.63	x	0.7	=	165.72	(77)
Southeast	0.9x	0.77	x	0.78	x	92.85	x	0.63	x	0.7	=	88.54	(77)
Southeast	0.9x	0.77	x	1.46	x	69.27	x	0.63	x	0.7	=	123.63	(77)
Southeast	0.9x	0.77	x	0.78	x	69.27	x	0.63	x	0.7	=	66.05	(77)
Southeast	0.9x	0.77	x	1.46	x	44.07	x	0.63	x	0.7	=	78.66	(77)
Southeast	0.9x	0.77	x	0.78	x	44.07	x	0.63	x	0.7	=	42.02	(77)
Southeast	0.9x	0.77	x	1.46	x	31.49	x	0.63	x	0.7	=	56.2	(77)
Southeast	0.9x	0.77	x	0.78	x	31.49	x	0.63	x	0.7	=	30.02	(77)
South	0.9x	0.77	x	0.71	x	46.75	x	0.63	x	0.7	=	20.29	(78)
South	0.9x	0.77	x	0.78	x	46.75	x	0.63	x	0.7	=	22.29	(78)
South	0.9x	0.77	x	1.46	x	46.75	x	0.63	x	0.7	=	20.86	(78)
South	0.9x	0.77	x	0.78	x	46.75	x	0.63	x	0.7	=	22.29	(78)
South	0.9x	0.77	x	0.71	x	76.57	x	0.63	x	0.7	=	33.23	(78)
South	0.9x	0.77	x	0.78	x	76.57	x	0.63	x	0.7	=	36.5	(78)
South	0.9x	0.77	x	1.46	x	76.57	x	0.63	x	0.7	=	34.16	(78)
South	0.9x	0.77	x	0.78	x	76.57	x	0.63	x	0.7	=	36.5	(78)
South	0.9x	0.77	x	0.71	x	97.53	x	0.63	x	0.7	=	42.33	(78)
South	0.9x	0.77	x	0.78	x	97.53	x	0.63	x	0.7	=	46.5	(78)
South	0.9x	0.77	x	1.46	x	97.53	x	0.63	x	0.7	=	43.52	(78)
South	0.9x	0.77	x	0.78	x	97.53	x	0.63	x	0.7	=	46.5	(78)

DER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	0.71	x	110.23	x	0.63	x	0.7	=	47.84	(78)
South	0.9x	0.77	x	0.78	x	110.23	x	0.63	x	0.7	=	52.55	(78)
South	0.9x	0.77	x	1.46	x	110.23	x	0.63	x	0.7	=	49.19	(78)
South	0.9x	0.77	x	0.78	x	110.23	x	0.63	x	0.7	=	52.55	(78)
South	0.9x	0.77	x	0.71	x	114.87	x	0.63	x	0.7	=	49.85	(78)
South	0.9x	0.77	x	0.78	x	114.87	x	0.63	x	0.7	=	54.77	(78)
South	0.9x	0.77	x	1.46	x	114.87	x	0.63	x	0.7	=	51.25	(78)
South	0.9x	0.77	x	0.78	x	114.87	x	0.63	x	0.7	=	54.77	(78)
South	0.9x	0.77	x	0.71	x	110.55	x	0.63	x	0.7	=	47.97	(78)
South	0.9x	0.77	x	0.78	x	110.55	x	0.63	x	0.7	=	52.7	(78)
South	0.9x	0.77	x	1.46	x	110.55	x	0.63	x	0.7	=	49.33	(78)
South	0.9x	0.77	x	0.78	x	110.55	x	0.63	x	0.7	=	52.7	(78)
South	0.9x	0.77	x	0.71	x	108.01	x	0.63	x	0.7	=	46.87	(78)
South	0.9x	0.77	x	0.78	x	108.01	x	0.63	x	0.7	=	51.5	(78)
South	0.9x	0.77	x	1.46	x	108.01	x	0.63	x	0.7	=	48.19	(78)
South	0.9x	0.77	x	0.78	x	108.01	x	0.63	x	0.7	=	51.5	(78)
South	0.9x	0.77	x	0.71	x	104.89	x	0.63	x	0.7	=	45.52	(78)
South	0.9x	0.77	x	0.78	x	104.89	x	0.63	x	0.7	=	50.01	(78)
South	0.9x	0.77	x	1.46	x	104.89	x	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	x	0.78	x	104.89	x	0.63	x	0.7	=	50.01	(78)
South	0.9x	0.77	x	0.71	x	101.89	x	0.63	x	0.7	=	44.22	(78)
South	0.9x	0.77	x	0.78	x	101.89	x	0.63	x	0.7	=	48.57	(78)
South	0.9x	0.77	x	1.46	x	101.89	x	0.63	x	0.7	=	45.46	(78)
South	0.9x	0.77	x	0.78	x	101.89	x	0.63	x	0.7	=	48.57	(78)
South	0.9x	0.77	x	0.71	x	82.59	x	0.63	x	0.7	=	35.84	(78)
South	0.9x	0.77	x	0.78	x	82.59	x	0.63	x	0.7	=	39.37	(78)
South	0.9x	0.77	x	1.46	x	82.59	x	0.63	x	0.7	=	36.85	(78)
South	0.9x	0.77	x	0.78	x	82.59	x	0.63	x	0.7	=	39.37	(78)
South	0.9x	0.77	x	0.71	x	55.42	x	0.63	x	0.7	=	24.05	(78)
South	0.9x	0.77	x	0.78	x	55.42	x	0.63	x	0.7	=	26.42	(78)
South	0.9x	0.77	x	1.46	x	55.42	x	0.63	x	0.7	=	24.73	(78)
South	0.9x	0.77	x	0.78	x	55.42	x	0.63	x	0.7	=	26.42	(78)
South	0.9x	0.77	x	0.71	x	40.4	x	0.63	x	0.7	=	17.53	(78)
South	0.9x	0.77	x	0.78	x	40.4	x	0.63	x	0.7	=	19.26	(78)
South	0.9x	0.77	x	1.46	x	40.4	x	0.63	x	0.7	=	18.03	(78)
South	0.9x	0.77	x	0.78	x	40.4	x	0.63	x	0.7	=	19.26	(78)
West	0.9x	0.77	x	2.86	x	19.64	x	0.63	x	0.7	=	17.17	(80)
West	0.9x	0.77	x	2.86	x	38.42	x	0.63	x	0.7	=	33.58	(80)
West	0.9x	0.77	x	2.86	x	63.27	x	0.63	x	0.7	=	55.3	(80)
West	0.9x	0.77	x	2.86	x	92.28	x	0.63	x	0.7	=	80.66	(80)
West	0.9x	0.77	x	2.86	x	113.09	x	0.63	x	0.7	=	98.85	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.86	x	115.77	x	0.63	x	0.7	=	101.19	(80)
West	0.9x	0.77	x	2.86	x	110.22	x	0.63	x	0.7	=	96.34	(80)
West	0.9x	0.77	x	2.86	x	94.68	x	0.63	x	0.7	=	82.75	(80)
West	0.9x	0.77	x	2.86	x	73.59	x	0.63	x	0.7	=	64.32	(80)
West	0.9x	0.77	x	2.86	x	45.59	x	0.63	x	0.7	=	39.85	(80)
West	0.9x	0.77	x	2.86	x	24.49	x	0.63	x	0.7	=	21.4	(80)
West	0.9x	0.77	x	2.86	x	16.15	x	0.63	x	0.7	=	14.12	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	322.49	580.21	865.8	1176.83	1401.17	1424.37	1359.61	1189.25	974.15	661.63	392.14	272.06	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	713.87	969.5	1241.19	1529.75	1731.21	1732.37	1653.3	1488.99	1285.43	995.59	752.19	651.74	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.91	0.85	0.76	0.64	0.5	0.38	0.29	0.32	0.5	0.72	0.87	0.92	(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=	20.29	20.29	20.29	20.3	20.31	20.32	20.32	20.32	20.31	20.31	20.3	20.3	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.9	0.84	0.75	0.62	0.48	0.34	0.25	0.28	0.46	0.7	0.86	0.91	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.29	20.29	20.29	20.3	20.31	20.32	20.32	20.32	20.31	20.31	20.3	20.3	(90)

fLA = Living area ÷ (4) = 0.31 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.51	20.51	20.51	20.52	20.52	20.53	20.53	20.53	20.53	20.52	20.52	20.52	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.51	20.51	20.51	20.52	20.52	20.53	20.53	20.53	20.53	20.52	20.52	20.52	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.9	0.84	0.75	0.62	0.48	0.35	0.26	0.3	0.48	0.71	0.86	0.92	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	644.55	815.18	932.31	952.3	838.83	613.17	427.25	440.07	611.38	707.47	647.24	596.89	(95)

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1948.11	1870.57	1674.02	1367.32	1034.91	684.96	453.98	475.76	746.99	1163.92	1583.74	1937.36	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	969.85	709.22	551.83	298.82	145.88	0	0	0	0	339.6	674.28	997.3	

DER WorkSheet: New dwelling design stage

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	4686.78	(98)
Space heating requirement in kWh/m²/year	55.46	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system	0.05	(201)
Fraction of space heat from main system(s) (202) = 1 – (201) =	0.95	(202)
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =	0.95	(204)
Efficiency of main space heating system 1	323.74	(206)
Efficiency of secondary/supplementary heating system, %	100	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	969.85	709.22	551.83	298.82	145.88	0	0	0	0	339.6	674.28	997.3	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	285.79	208.99	162.61	88.06	42.99	0	0	0	0	100.07	198.7	293.89	(211)

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1381.1 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(215)m=	44.61	32.62	25.38	13.75	6.71	0	0	0	0	15.62	31.02	45.88

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 215.59 (215)

Water heating

Output from water heater (calculated above)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	168.36	147.65	153.32	135.02	130.56	114.13	107.21	120.96	121.78	140.12	151.22	163.49

Efficiency of water heater 194.18 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	86.7	76.04	78.96	69.53	67.23	58.78	55.21	62.29	62.71	72.16	77.87	84.2

Total = Sum(219a)$_{1...12}$ = 851.7 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1381.1
Space heating fuel used, secondary		215.59
Water heating fuel used		851.7
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	275.31	(230a)
warm air heating system fans	123.09	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		398.4 (231)
Electricity for lighting		359.9 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3206.69 (338)

12a. CO2 emissions – Individual heating systems including micro-CHP

DER WorkSheet: New dwelling design stage

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.519	=	716.79	(261)
Space heating (secondary)	(215)	x	0.519	=	111.89	(263)
Water heating	(219)	x	0.519	=	442.03	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1270.71	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	206.77	(267)
Electricity for lighting	(232)	x	0.519	=	186.79	(268)
Total CO2, kg/year		sum of (265)…(271) =			1664.27	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			19.7	(273)
EI rating (section 14)					83	(274)

Predicted Energy Assessment

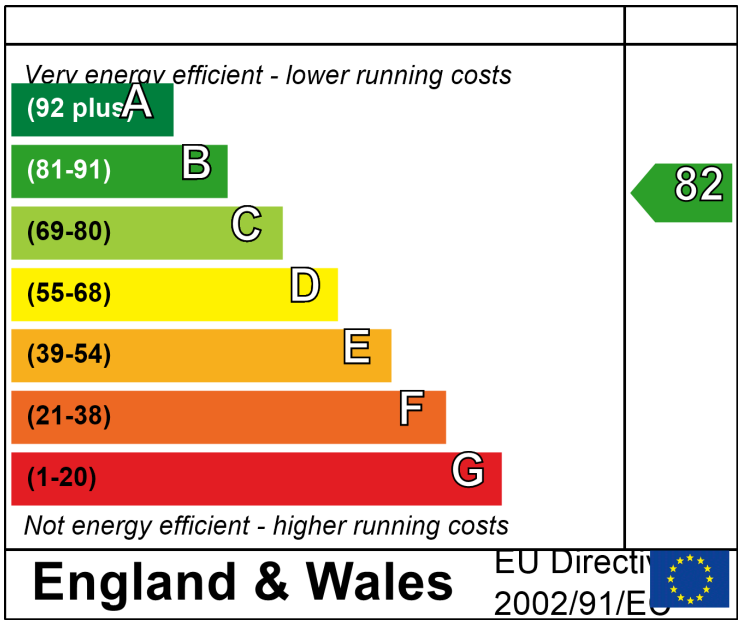
FLAT 22
43 London Street
Reading
RG1 4PS

Dwelling type: Top floor Maisonette
Date of assessment: 23 June 2025
Produced by: Ondrej Gajdos
Total floor area: 84.5 m²

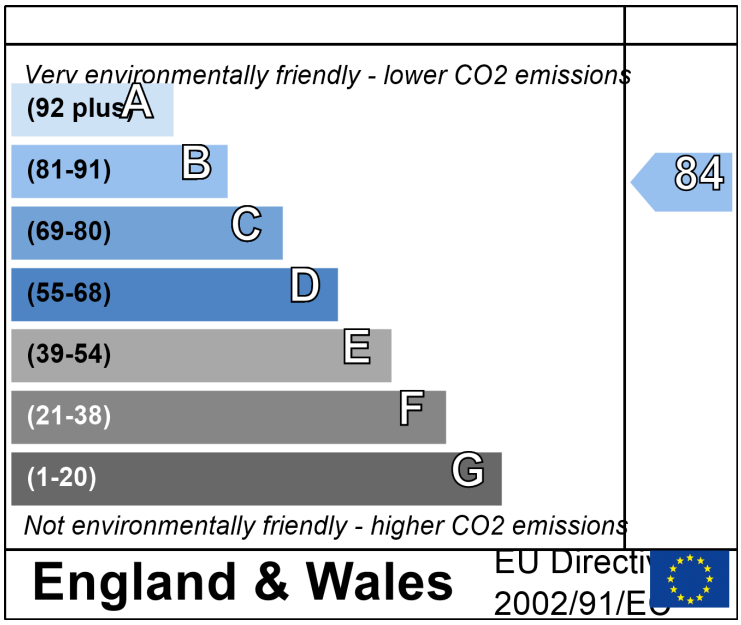
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 22

Address : FLAT 22, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46 (1a)	x	2.2 (2a)	=	101.2	(3a)
First floor	38.5 (1b)	x	2.7 (2b)	=	103.95	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	84.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	205.15	(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				5 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.25 (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) =			0.21 (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

SAP WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.27	0.27	0.26	0.23	0.23	0.2	0.2	0.2	0.21	0.23	0.24	0.25

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) = 73.1 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.41	0.4	0.39	0.37	0.36	0.34	0.34	0.33	0.35	0.36	0.37	0.38	(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=	0.41	0.4	0.39	0.37	0.36	0.34	0.34	0.33	0.35	0.36	0.37	0.38	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	0.33	=	0.693			(26)
Windows Type 1			0.71	x1/[1/(1.1)+ 0.04]		=	0.75			(27)
Windows Type 2			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 3			2.86	x1/[1/(1.1)+ 0.04]		=	3.01			(27)
Windows Type 4			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 5			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 6			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 7			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 8			1.46	x1/[1/(1.1)+ 0.04]		=	1.54			(27)
Windows Type 9			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 10			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 11			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 12			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Windows Type 13			0.78	x1/[1/(1.1)+ 0.04]		=	0.82			(27)
Floor			14.3	x	0.17	=	2.431	20	286	(28)
Walls Type1	128.87	42.46	86.41	x	0.12	=	10.37	14	1209.74	(29)
Walls Type2	13.86	2.1	11.76	x	0.14	=	1.65	14	164.64	(29)

SAP WorkSheet: New dwelling design stage

Roof	56.5	0	56.5	x	0.11	=	6.21	9	508.5 (30)
Total area of elements, m²			213.53						(31)
Party floor			41.2					30	1236 (32a)
Internal wall **			202.04					9	1818.36 (32c)
Internal floor			28.3					18	509.4 (32d)
Internal ceiling			28.3					9	254.7 (32e)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 66.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5987.34 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 70.86 (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 26.63 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 92.72 (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=	27.45	27.09	26.73	24.93	24.57	22.77	22.77	22.41	23.49	24.57	25.29	26.01	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	120.17	119.81	119.45	117.65	117.29	115.49	115.49	115.13	116.21	117.29	118.01	118.73	

Average = Sum(39)$_{1...12}$ /12= 117.56 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.42	1.42	1.41	1.39	1.39	1.37	1.37	1.36	1.38	1.39	1.4	1.41	

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 2.54 (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 94.59 (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=	104.05	100.27	96.48	92.7	88.91	85.13	85.13	88.91	92.7	96.48	100.27	104.05	

Total = Sum(44)$_{1...12}$ = 1135.08 (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=	154.3	134.95	139.26	121.41	116.5	100.53	93.15	106.89	108.17	126.06	137.61	149.43	

Total = Sum(45)$_{1...12}$ = 1488.26 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.15	20.24	20.89	18.21	17.47	15.08	13.97	16.03	16.23	18.91	20.64	22.41	(46)

SAP WorkSheet: New dwelling design stage

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel		180	(47)

If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day):		0.54	(48)
Temperature factor from Table 2b		0.4536	(49)
Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)
b) If manufacturer's declared cylinder loss factor is not known:			
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)
If community heating see section 4.3			
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		0.45	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(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=	14.06	12.7	14.06	13.61	14.06	13.61	14.06	14.06	13.61	14.06	13.61	14.06	(57)

Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	168.36	147.65	153.32	135.02	130.56	114.13	107.21	120.96	121.78	140.12	151.22	163.49	(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=	168.36	147.65	153.32	135.02	130.56	114.13	107.21	120.96	121.78	140.12	151.22	163.49	

Output from water heater (annual)$_{1...12}$	1653.83	(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=	51.31	44.87	46.3	40.37	38.73	33.43	30.97	35.54	35.97	41.92	45.75	49.69	(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=	152.56	152.56	152.56	152.56	152.56	152.56	152.56	152.56	152.56	152.56	152.56	152.56	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	50.95	45.25	36.8	27.86	20.83	17.58	19	24.69	33.14	42.08	49.12	52.36	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	341.18	344.72	335.8	316.8	292.83	270.29	255.24	251.7	260.62	279.61	303.59	326.12	(68)

SAP WorkSheet: New dwelling design stage

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	(69)

Pumps and fans gains (Table 5a)

(70)m=	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	12.31	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	(71)

Water heating gains (Table 5)

(72)m=	68.96	66.77	62.24	56.07	52.06	46.42	41.63	47.77	49.95	56.34	63.55	66.78	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	577.04	572.7	550.79	516.69	481.68	450.26	431.83	440.13	459.68	494	532.22	561.23	(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	1.46	x	10.63	x	0.63	x	0.7	=	4.74	(74)
North	0.9x 0.77	x	0.78	x	10.63	x	0.63	x	0.7	=	2.53	(74)
North	0.9x 0.77	x	1.46	x	20.32	x	0.63	x	0.7	=	9.07	(74)
North	0.9x 0.77	x	0.78	x	20.32	x	0.63	x	0.7	=	4.84	(74)
North	0.9x 0.77	x	1.46	x	34.53	x	0.63	x	0.7	=	15.41	(74)
North	0.9x 0.77	x	0.78	x	34.53	x	0.63	x	0.7	=	8.23	(74)
North	0.9x 0.77	x	1.46	x	55.46	x	0.63	x	0.7	=	24.75	(74)
North	0.9x 0.77	x	0.78	x	55.46	x	0.63	x	0.7	=	13.22	(74)
North	0.9x 0.77	x	1.46	x	74.72	x	0.63	x	0.7	=	33.34	(74)
North	0.9x 0.77	x	0.78	x	74.72	x	0.63	x	0.7	=	17.81	(74)
North	0.9x 0.77	x	1.46	x	79.99	x	0.63	x	0.7	=	35.69	(74)
North	0.9x 0.77	x	0.78	x	79.99	x	0.63	x	0.7	=	19.07	(74)
North	0.9x 0.77	x	1.46	x	74.68	x	0.63	x	0.7	=	33.32	(74)
North	0.9x 0.77	x	0.78	x	74.68	x	0.63	x	0.7	=	17.8	(74)
North	0.9x 0.77	x	1.46	x	59.25	x	0.63	x	0.7	=	26.44	(74)
North	0.9x 0.77	x	0.78	x	59.25	x	0.63	x	0.7	=	14.12	(74)
North	0.9x 0.77	x	1.46	x	41.52	x	0.63	x	0.7	=	18.52	(74)
North	0.9x 0.77	x	0.78	x	41.52	x	0.63	x	0.7	=	9.9	(74)
North	0.9x 0.77	x	1.46	x	24.19	x	0.63	x	0.7	=	10.79	(74)
North	0.9x 0.77	x	0.78	x	24.19	x	0.63	x	0.7	=	5.77	(74)
North	0.9x 0.77	x	1.46	x	13.12	x	0.63	x	0.7	=	5.85	(74)
North	0.9x 0.77	x	0.78	x	13.12	x	0.63	x	0.7	=	3.13	(74)
North	0.9x 0.77	x	1.46	x	8.86	x	0.63	x	0.7	=	3.96	(74)
North	0.9x 0.77	x	0.78	x	8.86	x	0.63	x	0.7	=	2.11	(74)
Northeast	0.9x 0.77	x	1.46	x	11.28	x	0.63	x	0.7	=	20.14	(75)
Northeast	0.9x 0.77	x	0.78	x	11.28	x	0.63	x	0.7	=	10.76	(75)

SAP WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	1.46	x	22.97	x	0.63	x	0.7	=	40.99	(75)
Northeast	0.9x	0.77	x	0.78	x	22.97	x	0.63	x	0.7	=	21.9	(75)
Northeast	0.9x	0.77	x	1.46	x	41.38	x	0.63	x	0.7	=	73.85	(75)
Northeast	0.9x	0.77	x	0.78	x	41.38	x	0.63	x	0.7	=	39.46	(75)
Northeast	0.9x	0.77	x	1.46	x	67.96	x	0.63	x	0.7	=	121.29	(75)
Northeast	0.9x	0.77	x	0.78	x	67.96	x	0.63	x	0.7	=	64.8	(75)
Northeast	0.9x	0.77	x	1.46	x	91.35	x	0.63	x	0.7	=	163.03	(75)
Northeast	0.9x	0.77	x	0.78	x	91.35	x	0.63	x	0.7	=	87.1	(75)
Northeast	0.9x	0.77	x	1.46	x	97.38	x	0.63	x	0.7	=	173.81	(75)
Northeast	0.9x	0.77	x	0.78	x	97.38	x	0.63	x	0.7	=	92.86	(75)
Northeast	0.9x	0.77	x	1.46	x	91.1	x	0.63	x	0.7	=	162.6	(75)
Northeast	0.9x	0.77	x	0.78	x	91.1	x	0.63	x	0.7	=	86.87	(75)
Northeast	0.9x	0.77	x	1.46	x	72.63	x	0.63	x	0.7	=	129.62	(75)
Northeast	0.9x	0.77	x	0.78	x	72.63	x	0.63	x	0.7	=	69.25	(75)
Northeast	0.9x	0.77	x	1.46	x	50.42	x	0.63	x	0.7	=	89.99	(75)
Northeast	0.9x	0.77	x	0.78	x	50.42	x	0.63	x	0.7	=	48.08	(75)
Northeast	0.9x	0.77	x	1.46	x	28.07	x	0.63	x	0.7	=	50.09	(75)
Northeast	0.9x	0.77	x	0.78	x	28.07	x	0.63	x	0.7	=	26.76	(75)
Northeast	0.9x	0.77	x	1.46	x	14.2	x	0.63	x	0.7	=	25.34	(75)
Northeast	0.9x	0.77	x	0.78	x	14.2	x	0.63	x	0.7	=	13.54	(75)
Northeast	0.9x	0.77	x	1.46	x	9.21	x	0.63	x	0.7	=	16.45	(75)
Northeast	0.9x	0.77	x	0.78	x	9.21	x	0.63	x	0.7	=	8.79	(75)
East	0.9x	0.77	x	1.46	x	19.64	x	0.63	x	0.7	=	52.58	(76)
East	0.9x	0.77	x	0.78	x	19.64	x	0.63	x	0.7	=	28.09	(76)
East	0.9x	0.77	x	1.46	x	38.42	x	0.63	x	0.7	=	102.86	(76)
East	0.9x	0.77	x	0.78	x	38.42	x	0.63	x	0.7	=	54.95	(76)
East	0.9x	0.77	x	1.46	x	63.27	x	0.63	x	0.7	=	169.39	(76)
East	0.9x	0.77	x	0.78	x	63.27	x	0.63	x	0.7	=	90.5	(76)
East	0.9x	0.77	x	1.46	x	92.28	x	0.63	x	0.7	=	247.05	(76)
East	0.9x	0.77	x	0.78	x	92.28	x	0.63	x	0.7	=	131.99	(76)
East	0.9x	0.77	x	1.46	x	113.09	x	0.63	x	0.7	=	302.77	(76)
East	0.9x	0.77	x	0.78	x	113.09	x	0.63	x	0.7	=	161.75	(76)
East	0.9x	0.77	x	1.46	x	115.77	x	0.63	x	0.7	=	309.94	(76)
East	0.9x	0.77	x	0.78	x	115.77	x	0.63	x	0.7	=	165.58	(76)
East	0.9x	0.77	x	1.46	x	110.22	x	0.63	x	0.7	=	295.07	(76)
East	0.9x	0.77	x	0.78	x	110.22	x	0.63	x	0.7	=	157.64	(76)
East	0.9x	0.77	x	1.46	x	94.68	x	0.63	x	0.7	=	253.46	(76)
East	0.9x	0.77	x	0.78	x	94.68	x	0.63	x	0.7	=	135.41	(76)
East	0.9x	0.77	x	1.46	x	73.59	x	0.63	x	0.7	=	197.01	(76)
East	0.9x	0.77	x	0.78	x	73.59	x	0.63	x	0.7	=	105.25	(76)
East	0.9x	0.77	x	1.46	x	45.59	x	0.63	x	0.7	=	122.05	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	0.78	x	45.59	x	0.63	x	0.7	=	65.2	(76)
East	0.9x	0.77	x	1.46	x	24.49	x	0.63	x	0.7	=	65.56	(76)
East	0.9x	0.77	x	0.78	x	24.49	x	0.63	x	0.7	=	35.03	(76)
East	0.9x	0.77	x	1.46	x	16.15	x	0.63	x	0.7	=	43.24	(76)
East	0.9x	0.77	x	0.78	x	16.15	x	0.63	x	0.7	=	23.1	(76)
Southeast	0.9x	0.77	x	1.46	x	36.79	x	0.63	x	0.7	=	65.67	(77)
Southeast	0.9x	0.77	x	0.78	x	36.79	x	0.63	x	0.7	=	35.08	(77)
Southeast	0.9x	0.77	x	1.46	x	62.67	x	0.63	x	0.7	=	111.86	(77)
Southeast	0.9x	0.77	x	0.78	x	62.67	x	0.63	x	0.7	=	59.76	(77)
Southeast	0.9x	0.77	x	1.46	x	85.75	x	0.63	x	0.7	=	153.05	(77)
Southeast	0.9x	0.77	x	0.78	x	85.75	x	0.63	x	0.7	=	81.77	(77)
Southeast	0.9x	0.77	x	1.46	x	106.25	x	0.63	x	0.7	=	189.64	(77)
Southeast	0.9x	0.77	x	0.78	x	106.25	x	0.63	x	0.7	=	101.31	(77)
Southeast	0.9x	0.77	x	1.46	x	119.01	x	0.63	x	0.7	=	212.41	(77)
Southeast	0.9x	0.77	x	0.78	x	119.01	x	0.63	x	0.7	=	113.48	(77)
Southeast	0.9x	0.77	x	1.46	x	118.15	x	0.63	x	0.7	=	210.87	(77)
Southeast	0.9x	0.77	x	0.78	x	118.15	x	0.63	x	0.7	=	112.66	(77)
Southeast	0.9x	0.77	x	1.46	x	113.91	x	0.63	x	0.7	=	203.3	(77)
Southeast	0.9x	0.77	x	0.78	x	113.91	x	0.63	x	0.7	=	108.61	(77)
Southeast	0.9x	0.77	x	1.46	x	104.39	x	0.63	x	0.7	=	186.31	(77)
Southeast	0.9x	0.77	x	0.78	x	104.39	x	0.63	x	0.7	=	99.54	(77)
Southeast	0.9x	0.77	x	1.46	x	92.85	x	0.63	x	0.7	=	165.72	(77)
Southeast	0.9x	0.77	x	0.78	x	92.85	x	0.63	x	0.7	=	88.54	(77)
Southeast	0.9x	0.77	x	1.46	x	69.27	x	0.63	x	0.7	=	123.63	(77)
Southeast	0.9x	0.77	x	0.78	x	69.27	x	0.63	x	0.7	=	66.05	(77)
Southeast	0.9x	0.77	x	1.46	x	44.07	x	0.63	x	0.7	=	78.66	(77)
Southeast	0.9x	0.77	x	0.78	x	44.07	x	0.63	x	0.7	=	42.02	(77)
Southeast	0.9x	0.77	x	1.46	x	31.49	x	0.63	x	0.7	=	56.2	(77)
Southeast	0.9x	0.77	x	0.78	x	31.49	x	0.63	x	0.7	=	30.02	(77)
South	0.9x	0.77	x	0.71	x	46.75	x	0.63	x	0.7	=	20.29	(78)
South	0.9x	0.77	x	0.78	x	46.75	x	0.63	x	0.7	=	22.29	(78)
South	0.9x	0.77	x	1.46	x	46.75	x	0.63	x	0.7	=	20.86	(78)
South	0.9x	0.77	x	0.78	x	46.75	x	0.63	x	0.7	=	22.29	(78)
South	0.9x	0.77	x	0.71	x	76.57	x	0.63	x	0.7	=	33.23	(78)
South	0.9x	0.77	x	0.78	x	76.57	x	0.63	x	0.7	=	36.5	(78)
South	0.9x	0.77	x	1.46	x	76.57	x	0.63	x	0.7	=	34.16	(78)
South	0.9x	0.77	x	0.78	x	76.57	x	0.63	x	0.7	=	36.5	(78)
South	0.9x	0.77	x	0.71	x	97.53	x	0.63	x	0.7	=	42.33	(78)
South	0.9x	0.77	x	0.78	x	97.53	x	0.63	x	0.7	=	46.5	(78)
South	0.9x	0.77	x	1.46	x	97.53	x	0.63	x	0.7	=	43.52	(78)
South	0.9x	0.77	x	0.78	x	97.53	x	0.63	x	0.7	=	46.5	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	0.71	x	110.23	x	0.63	x	0.7	=	47.84	(78)
South	0.9x	0.77	x	0.78	x	110.23	x	0.63	x	0.7	=	52.55	(78)
South	0.9x	0.77	x	1.46	x	110.23	x	0.63	x	0.7	=	49.19	(78)
South	0.9x	0.77	x	0.78	x	110.23	x	0.63	x	0.7	=	52.55	(78)
South	0.9x	0.77	x	0.71	x	114.87	x	0.63	x	0.7	=	49.85	(78)
South	0.9x	0.77	x	0.78	x	114.87	x	0.63	x	0.7	=	54.77	(78)
South	0.9x	0.77	x	1.46	x	114.87	x	0.63	x	0.7	=	51.25	(78)
South	0.9x	0.77	x	0.78	x	114.87	x	0.63	x	0.7	=	54.77	(78)
South	0.9x	0.77	x	0.71	x	110.55	x	0.63	x	0.7	=	47.97	(78)
South	0.9x	0.77	x	0.78	x	110.55	x	0.63	x	0.7	=	52.7	(78)
South	0.9x	0.77	x	1.46	x	110.55	x	0.63	x	0.7	=	49.33	(78)
South	0.9x	0.77	x	0.78	x	110.55	x	0.63	x	0.7	=	52.7	(78)
South	0.9x	0.77	x	0.71	x	108.01	x	0.63	x	0.7	=	46.87	(78)
South	0.9x	0.77	x	0.78	x	108.01	x	0.63	x	0.7	=	51.5	(78)
South	0.9x	0.77	x	1.46	x	108.01	x	0.63	x	0.7	=	48.19	(78)
South	0.9x	0.77	x	0.78	x	108.01	x	0.63	x	0.7	=	51.5	(78)
South	0.9x	0.77	x	0.71	x	104.89	x	0.63	x	0.7	=	45.52	(78)
South	0.9x	0.77	x	0.78	x	104.89	x	0.63	x	0.7	=	50.01	(78)
South	0.9x	0.77	x	1.46	x	104.89	x	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	x	0.78	x	104.89	x	0.63	x	0.7	=	50.01	(78)
South	0.9x	0.77	x	0.71	x	101.89	x	0.63	x	0.7	=	44.22	(78)
South	0.9x	0.77	x	0.78	x	101.89	x	0.63	x	0.7	=	48.57	(78)
South	0.9x	0.77	x	1.46	x	101.89	x	0.63	x	0.7	=	45.46	(78)
South	0.9x	0.77	x	0.78	x	101.89	x	0.63	x	0.7	=	48.57	(78)
South	0.9x	0.77	x	0.71	x	82.59	x	0.63	x	0.7	=	35.84	(78)
South	0.9x	0.77	x	0.78	x	82.59	x	0.63	x	0.7	=	39.37	(78)
South	0.9x	0.77	x	1.46	x	82.59	x	0.63	x	0.7	=	36.85	(78)
South	0.9x	0.77	x	0.78	x	82.59	x	0.63	x	0.7	=	39.37	(78)
South	0.9x	0.77	x	0.71	x	55.42	x	0.63	x	0.7	=	24.05	(78)
South	0.9x	0.77	x	0.78	x	55.42	x	0.63	x	0.7	=	26.42	(78)
South	0.9x	0.77	x	1.46	x	55.42	x	0.63	x	0.7	=	24.73	(78)
South	0.9x	0.77	x	0.78	x	55.42	x	0.63	x	0.7	=	26.42	(78)
South	0.9x	0.77	x	0.71	x	40.4	x	0.63	x	0.7	=	17.53	(78)
South	0.9x	0.77	x	0.78	x	40.4	x	0.63	x	0.7	=	19.26	(78)
South	0.9x	0.77	x	1.46	x	40.4	x	0.63	x	0.7	=	18.03	(78)
South	0.9x	0.77	x	0.78	x	40.4	x	0.63	x	0.7	=	19.26	(78)
West	0.9x	0.77	x	2.86	x	19.64	x	0.63	x	0.7	=	17.17	(80)
West	0.9x	0.77	x	2.86	x	38.42	x	0.63	x	0.7	=	33.58	(80)
West	0.9x	0.77	x	2.86	x	63.27	x	0.63	x	0.7	=	55.3	(80)
West	0.9x	0.77	x	2.86	x	92.28	x	0.63	x	0.7	=	80.66	(80)
West	0.9x	0.77	x	2.86	x	113.09	x	0.63	x	0.7	=	98.85	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	2.86	x	115.77	x	0.63	x	0.7	=	101.19	(80)
West	0.9x	0.77	x	2.86	x	110.22	x	0.63	x	0.7	=	96.34	(80)
West	0.9x	0.77	x	2.86	x	94.68	x	0.63	x	0.7	=	82.75	(80)
West	0.9x	0.77	x	2.86	x	73.59	x	0.63	x	0.7	=	64.32	(80)
West	0.9x	0.77	x	2.86	x	45.59	x	0.63	x	0.7	=	39.85	(80)
West	0.9x	0.77	x	2.86	x	24.49	x	0.63	x	0.7	=	21.4	(80)
West	0.9x	0.77	x	2.86	x	16.15	x	0.63	x	0.7	=	14.12	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	322.49	580.21	865.8	1176.83	1401.17	1424.37	1359.61	1189.25	974.15	661.63	392.14	272.06	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	899.54	1152.91	1416.6	1693.52	1882.85	1874.63	1791.44	1629.38	1433.84	1155.63	924.36	833.29	(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=	0.87	0.81	0.72	0.6	0.47	0.35	0.27	0.3	0.46	0.68	0.82	0.88	(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=	20.29	20.29	20.29	20.3	20.31	20.32	20.32	20.32	20.31	20.31	20.3	20.3	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.86	0.8	0.71	0.58	0.45	0.32	0.23	0.26	0.43	0.66	0.81	0.88	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.29	20.29	20.29	20.3	20.31	20.32	20.32	20.32	20.31	20.31	20.3	20.3	(90)

fLA = Living area ÷ (4) = 0.31 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.51	20.51	20.51	20.52	20.52	20.53	20.53	20.53	20.53	20.52	20.52	20.52	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.51	20.51	20.51	20.52	20.52	20.53	20.53	20.53	20.53	20.52	20.52	20.52	(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=	0.86	0.8	0.71	0.59	0.46	0.33	0.24	0.27	0.44	0.66	0.82	0.88	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	777.16	922.88	1008.36	995.28	859.28	621.32	430.59	444.9	629.86	766	753.91	731.86	(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=	1948.11	1870.57	1674.02	1367.32	1034.91	684.96	453.98	475.76	746.99	1163.92	1583.74	1937.36	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	871.19	636.85	495.25	267.87	130.66	0	0	0	0	296.06	597.48	896.89	

SAP WorkSheet: New dwelling design stage

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	4192.25	(98)
Space heating requirement in kWh/m²/year	49.61	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system	0.05	(201)
Fraction of space heat from main system(s) (202) = 1 – (201) =	0.95	(202)
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =	0.95	(204)
Efficiency of main space heating system 1	323.74	(206)
Efficiency of secondary/supplementary heating system, %	100	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	871.19	636.85	495.25	267.87	130.66	0	0	0	0	296.06	597.48	896.89	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	256.72	187.67	145.94	78.94	38.5	0	0	0	0	87.24	176.06	264.29	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1235.37 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(215)m=	40.07	29.3	22.78	12.32	6.01	0	0	0	0	13.62	27.48	41.26

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 192.84 (215)

Water heating

Output from water heater (calculated above)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	168.36	147.65	153.32	135.02	130.56	114.13	107.21	120.96	121.78	140.12	151.22	163.49

Efficiency of water heater 194.18 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18	194.18

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	86.7	76.04	78.96	69.53	67.23	58.78	55.21	62.29	62.71	72.16	77.87	84.2

Total = Sum(219a)$_{1...12}$ = 851.7 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1235.37
Space heating fuel used, secondary		192.84
Water heating fuel used		851.7
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	275.31	(230a)
warm air heating system fans	123.09	(230b)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		398.4 (231)
Electricity for lighting		359.9 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3038.21 (338)

10a. Fuel costs - individual heating systems:

SAP WorkSheet: New dwelling design stage

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		13.19	x 0.01 =	162.95	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	25.44	(242)
Water heating cost (other fuel)	(219)		13.19	x 0.01 =	112.34	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	52.55	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	47.47	(250)
Additional standing charges (Table 12)					0	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				400.74	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF) [(255) x (256)] ÷ [(4) + 45.0] =	1.3	(257)
SAP rating (Section 12)	81.87	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.519	=	641.16	(261)
Space heating (secondary)	(215) x		0.519	=	100.09	(263)
Water heating	(219) x		0.519	=	442.03	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1183.27	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	206.77	(267)
Electricity for lighting	(232) x		0.519	=	186.79	(268)
Total CO2, kg/year		sum of (265)…(271) =			1576.83	(272)
CO2 emissions per m²		(272) ÷ (4) =			18.66	(273)
EI rating (section 14)					84	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		3.07	=	3792.58	(261)
Space heating (secondary)	(215) x		3.07	=	592.03	(263)
Energy for water heating	(219) x		3.07	=	2614.71	(264)
Space and water heating	(261) + (262) + (263) + (264) =				6999.33	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	1223.09	(267)

SAP WorkSheet: New dwelling design stage

Electricity for lighting	(232) x	0	=	1104.88	(268)
‘Total Primary Energy		sum of (265)…(271) =		9327.3	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		110.38	(273)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.60

Property Address: FLAT 22

Address : FLAT 22, 43 London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46 (1a)	x	2.2 (2a)	=	101.2	(3a)
First floor	38.5 (1b)	x	2.7 (2b)	=	103.95	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	84.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	205.15	(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

TER WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			0.32	x1/[1/(1.4)+ 0.04]		=	0.42			(27)
Windows Type 2			0.35	x1/[1/(1.4)+ 0.04]		=	0.46			(27)
Windows Type 3			1.28	x1/[1/(1.4)+ 0.04]		=	1.7			(27)
Windows Type 4			0.65	x1/[1/(1.4)+ 0.04]		=	0.86			(27)
Windows Type 5			0.65	x1/[1/(1.4)+ 0.04]		=	0.86			(27)
Windows Type 6			0.65	x1/[1/(1.4)+ 0.04]		=	0.86			(27)
Windows Type 7			0.65	x1/[1/(1.4)+ 0.04]		=	0.86			(27)
Windows Type 8			0.65	x1/[1/(1.4)+ 0.04]		=	0.86			(27)
Windows Type 9			0.35	x1/[1/(1.4)+ 0.04]		=	0.46			(27)
Windows Type 10			0.35	x1/[1/(1.4)+ 0.04]		=	0.46			(27)
Windows Type 11			0.35	x1/[1/(1.4)+ 0.04]		=	0.46			(27)
Windows Type 12			0.35	x1/[1/(1.4)+ 0.04]		=	0.46			(27)
Windows Type 13			0.35	x1/[1/(1.4)+ 0.04]		=	0.46			(27)
Floor			14.3	x	0.13	=	1.859			(28)
Walls Type1	128.87	18.97	109.9	x	0.18	=	19.78			(29)
Walls Type2	13.86	2.1	11.76	x	0.18	=	2.12			(29)

TER WorkSheet: New dwelling design stage

Roof	56.5	0	56.5	x	0.13	=	7.34		(30)
Total area of elements, m²			213.53						(31)
Party floor			41.2						(32a)
Internal wall **			202.04						(32c)
Internal floor			28.3						(32d)
Internal ceiling			28.3						(32e)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 58.35 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6316.2 (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 36.83 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 95.19 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	40.09	39.85	39.61	38.5	38.29	37.32	37.32	37.14	37.69	38.29	38.71	39.15	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	135.28	135.04	134.8	133.68	133.47	132.5	132.5	132.32	132.88	133.47	133.9	134.34	

Average = Sum(39)$_{1...12}$ /12= 133.68 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.6	1.6	1.6	1.58	1.58	1.57	1.57	1.57	1.57	1.58	1.58	1.59	

Average = Sum(40)$_{1...12}$ /12= 1.58 (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 2.54 (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 94.59 (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=	104.05	100.27	96.48	92.7	88.91	85.13	85.13	88.91	92.7	96.48	100.27	104.05	

Total = Sum(44)$_{1...12}$ = 1135.08 (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=	154.3	134.95	139.26	121.41	116.5	100.53	93.15	106.89	108.17	126.06	137.61	149.43	

Total = Sum(45)$_{1...12}$ = 1488.26 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.15	20.24	20.89	18.21	17.47	15.08	13.97	16.03	16.23	18.91	20.64	22.41	(46)

TER WorkSheet: New dwelling design stage

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):		1.55	(48)
Temperature factor from Table 2b		0.54	(49)
Energy lost from water storage, kWh/year	(48) x (49) =	0.84	(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)		0.84	(55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	25.98	23.47	25.98	25.14	25.98	25.14	25.98	25.98	25.14	25.98	25.14	25.98	(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=	203.54	179.43	188.5	169.06	165.74	148.18	142.4	156.14	155.82	175.31	185.26	198.68	(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=	203.54	179.43	188.5	169.06	165.74	148.18	142.4	156.14	155.82	175.31	185.26	198.68	

Output from water heater (annual)$_{1...12}$ 2068.06 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	90.7	80.45	85.7	78.49	78.13	71.55	70.37	74.94	74.09	81.31	83.88	89.08	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	127.14	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.38	18.1	14.72	11.14	8.33	7.03	7.6	9.88	13.26	16.83	19.65	20.94	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	228.59	230.96	224.98	212.26	196.19	181.1	171.01	168.64	174.62	187.34	203.4	218.5	(68)

TER WorkSheet: New dwelling design stage

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	35.71	(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=	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	-101.71	(71)

Water heating gains (Table 5)

(72)m=	121.91	119.72	115.19	109.02	105.01	99.37	94.58	100.72	102.9	109.29	116.5	119.73	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	435.01	432.92	419.03	396.56	373.68	351.64	337.33	343.38	354.92	377.6	403.69	423.32	(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 0.65	x	10.63	x	0.63	x	0.7	=	2.11	(74)
North	0.9x	0.77	x 0.35	x	10.63	x	0.63	x	0.7	=	1.14	(74)
North	0.9x	0.77	x 0.65	x	20.32	x	0.63	x	0.7	=	4.04	(74)
North	0.9x	0.77	x 0.35	x	20.32	x	0.63	x	0.7	=	2.17	(74)
North	0.9x	0.77	x 0.65	x	34.53	x	0.63	x	0.7	=	6.86	(74)
North	0.9x	0.77	x 0.35	x	34.53	x	0.63	x	0.7	=	3.69	(74)
North	0.9x	0.77	x 0.65	x	55.46	x	0.63	x	0.7	=	11.02	(74)
North	0.9x	0.77	x 0.35	x	55.46	x	0.63	x	0.7	=	5.93	(74)
North	0.9x	0.77	x 0.65	x	74.72	x	0.63	x	0.7	=	14.84	(74)
North	0.9x	0.77	x 0.35	x	74.72	x	0.63	x	0.7	=	7.99	(74)
North	0.9x	0.77	x 0.65	x	79.99	x	0.63	x	0.7	=	15.89	(74)
North	0.9x	0.77	x 0.35	x	79.99	x	0.63	x	0.7	=	8.56	(74)
North	0.9x	0.77	x 0.65	x	74.68	x	0.63	x	0.7	=	14.83	(74)
North	0.9x	0.77	x 0.35	x	74.68	x	0.63	x	0.7	=	7.99	(74)
North	0.9x	0.77	x 0.65	x	59.25	x	0.63	x	0.7	=	11.77	(74)
North	0.9x	0.77	x 0.35	x	59.25	x	0.63	x	0.7	=	6.34	(74)
North	0.9x	0.77	x 0.65	x	41.52	x	0.63	x	0.7	=	8.25	(74)
North	0.9x	0.77	x 0.35	x	41.52	x	0.63	x	0.7	=	4.44	(74)
North	0.9x	0.77	x 0.65	x	24.19	x	0.63	x	0.7	=	4.81	(74)
North	0.9x	0.77	x 0.35	x	24.19	x	0.63	x	0.7	=	2.59	(74)
North	0.9x	0.77	x 0.65	x	13.12	x	0.63	x	0.7	=	2.61	(74)
North	0.9x	0.77	x 0.35	x	13.12	x	0.63	x	0.7	=	1.4	(74)
North	0.9x	0.77	x 0.65	x	8.86	x	0.63	x	0.7	=	1.76	(74)
North	0.9x	0.77	x 0.35	x	8.86	x	0.63	x	0.7	=	0.95	(74)
Northeast	0.9x	0.77	x 0.65	x	11.28	x	0.63	x	0.7	=	8.97	(75)
Northeast	0.9x	0.77	x 0.35	x	11.28	x	0.63	x	0.7	=	4.83	(75)

TER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	0.65	x	22.97	x	0.63	x	0.7	=	18.25	(75)
Northeast	0.9x	0.77	x	0.35	x	22.97	x	0.63	x	0.7	=	9.83	(75)
Northeast	0.9x	0.77	x	0.65	x	41.38	x	0.63	x	0.7	=	32.88	(75)
Northeast	0.9x	0.77	x	0.35	x	41.38	x	0.63	x	0.7	=	17.7	(75)
Northeast	0.9x	0.77	x	0.65	x	67.96	x	0.63	x	0.7	=	54	(75)
Northeast	0.9x	0.77	x	0.35	x	67.96	x	0.63	x	0.7	=	29.08	(75)
Northeast	0.9x	0.77	x	0.65	x	91.35	x	0.63	x	0.7	=	72.58	(75)
Northeast	0.9x	0.77	x	0.35	x	91.35	x	0.63	x	0.7	=	39.08	(75)
Northeast	0.9x	0.77	x	0.65	x	97.38	x	0.63	x	0.7	=	77.38	(75)
Northeast	0.9x	0.77	x	0.35	x	97.38	x	0.63	x	0.7	=	41.67	(75)
Northeast	0.9x	0.77	x	0.65	x	91.1	x	0.63	x	0.7	=	72.39	(75)
Northeast	0.9x	0.77	x	0.35	x	91.1	x	0.63	x	0.7	=	38.98	(75)
Northeast	0.9x	0.77	x	0.65	x	72.63	x	0.63	x	0.7	=	57.71	(75)
Northeast	0.9x	0.77	x	0.35	x	72.63	x	0.63	x	0.7	=	31.07	(75)
Northeast	0.9x	0.77	x	0.65	x	50.42	x	0.63	x	0.7	=	40.06	(75)
Northeast	0.9x	0.77	x	0.35	x	50.42	x	0.63	x	0.7	=	21.57	(75)
Northeast	0.9x	0.77	x	0.65	x	28.07	x	0.63	x	0.7	=	22.3	(75)
Northeast	0.9x	0.77	x	0.35	x	28.07	x	0.63	x	0.7	=	12.01	(75)
Northeast	0.9x	0.77	x	0.65	x	14.2	x	0.63	x	0.7	=	11.28	(75)
Northeast	0.9x	0.77	x	0.35	x	14.2	x	0.63	x	0.7	=	6.07	(75)
Northeast	0.9x	0.77	x	0.65	x	9.21	x	0.63	x	0.7	=	7.32	(75)
Northeast	0.9x	0.77	x	0.35	x	9.21	x	0.63	x	0.7	=	3.94	(75)
East	0.9x	0.77	x	0.65	x	19.64	x	0.63	x	0.7	=	23.41	(76)
East	0.9x	0.77	x	0.35	x	19.64	x	0.63	x	0.7	=	12.6	(76)
East	0.9x	0.77	x	0.65	x	38.42	x	0.63	x	0.7	=	45.79	(76)
East	0.9x	0.77	x	0.35	x	38.42	x	0.63	x	0.7	=	24.66	(76)
East	0.9x	0.77	x	0.65	x	63.27	x	0.63	x	0.7	=	75.41	(76)
East	0.9x	0.77	x	0.35	x	63.27	x	0.63	x	0.7	=	40.61	(76)
East	0.9x	0.77	x	0.65	x	92.28	x	0.63	x	0.7	=	109.99	(76)
East	0.9x	0.77	x	0.35	x	92.28	x	0.63	x	0.7	=	59.22	(76)
East	0.9x	0.77	x	0.65	x	113.09	x	0.63	x	0.7	=	134.79	(76)
East	0.9x	0.77	x	0.35	x	113.09	x	0.63	x	0.7	=	72.58	(76)
East	0.9x	0.77	x	0.65	x	115.77	x	0.63	x	0.7	=	137.99	(76)
East	0.9x	0.77	x	0.35	x	115.77	x	0.63	x	0.7	=	74.3	(76)
East	0.9x	0.77	x	0.65	x	110.22	x	0.63	x	0.7	=	131.37	(76)
East	0.9x	0.77	x	0.35	x	110.22	x	0.63	x	0.7	=	70.74	(76)
East	0.9x	0.77	x	0.65	x	94.68	x	0.63	x	0.7	=	112.84	(76)
East	0.9x	0.77	x	0.35	x	94.68	x	0.63	x	0.7	=	60.76	(76)
East	0.9x	0.77	x	0.65	x	73.59	x	0.63	x	0.7	=	87.71	(76)
East	0.9x	0.77	x	0.35	x	73.59	x	0.63	x	0.7	=	47.23	(76)
East	0.9x	0.77	x	0.65	x	45.59	x	0.63	x	0.7	=	54.34	(76)

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	0.35	x	45.59	x	0.63	x	0.7	=	29.26	(76)
East	0.9x	0.77	x	0.65	x	24.49	x	0.63	x	0.7	=	29.19	(76)
East	0.9x	0.77	x	0.35	x	24.49	x	0.63	x	0.7	=	15.72	(76)
East	0.9x	0.77	x	0.65	x	16.15	x	0.63	x	0.7	=	19.25	(76)
East	0.9x	0.77	x	0.35	x	16.15	x	0.63	x	0.7	=	10.37	(76)
Southeast	0.9x	0.77	x	0.65	x	36.79	x	0.63	x	0.7	=	29.24	(77)
Southeast	0.9x	0.77	x	0.35	x	36.79	x	0.63	x	0.7	=	15.74	(77)
Southeast	0.9x	0.77	x	0.65	x	62.67	x	0.63	x	0.7	=	49.8	(77)
Southeast	0.9x	0.77	x	0.35	x	62.67	x	0.63	x	0.7	=	26.82	(77)
Southeast	0.9x	0.77	x	0.65	x	85.75	x	0.63	x	0.7	=	68.14	(77)
Southeast	0.9x	0.77	x	0.35	x	85.75	x	0.63	x	0.7	=	36.69	(77)
Southeast	0.9x	0.77	x	0.65	x	106.25	x	0.63	x	0.7	=	84.43	(77)
Southeast	0.9x	0.77	x	0.35	x	106.25	x	0.63	x	0.7	=	45.46	(77)
Southeast	0.9x	0.77	x	0.65	x	119.01	x	0.63	x	0.7	=	94.57	(77)
Southeast	0.9x	0.77	x	0.35	x	119.01	x	0.63	x	0.7	=	50.92	(77)
Southeast	0.9x	0.77	x	0.65	x	118.15	x	0.63	x	0.7	=	93.88	(77)
Southeast	0.9x	0.77	x	0.35	x	118.15	x	0.63	x	0.7	=	50.55	(77)
Southeast	0.9x	0.77	x	0.65	x	113.91	x	0.63	x	0.7	=	90.51	(77)
Southeast	0.9x	0.77	x	0.35	x	113.91	x	0.63	x	0.7	=	48.74	(77)
Southeast	0.9x	0.77	x	0.65	x	104.39	x	0.63	x	0.7	=	82.95	(77)
Southeast	0.9x	0.77	x	0.35	x	104.39	x	0.63	x	0.7	=	44.66	(77)
Southeast	0.9x	0.77	x	0.65	x	92.85	x	0.63	x	0.7	=	73.78	(77)
Southeast	0.9x	0.77	x	0.35	x	92.85	x	0.63	x	0.7	=	39.73	(77)
Southeast	0.9x	0.77	x	0.65	x	69.27	x	0.63	x	0.7	=	55.04	(77)
Southeast	0.9x	0.77	x	0.35	x	69.27	x	0.63	x	0.7	=	29.64	(77)
Southeast	0.9x	0.77	x	0.65	x	44.07	x	0.63	x	0.7	=	35.02	(77)
Southeast	0.9x	0.77	x	0.35	x	44.07	x	0.63	x	0.7	=	18.86	(77)
Southeast	0.9x	0.77	x	0.65	x	31.49	x	0.63	x	0.7	=	25.02	(77)
Southeast	0.9x	0.77	x	0.35	x	31.49	x	0.63	x	0.7	=	13.47	(77)
South	0.9x	0.77	x	0.32	x	46.75	x	0.63	x	0.7	=	9.14	(78)
South	0.9x	0.77	x	0.35	x	46.75	x	0.63	x	0.7	=	10	(78)
South	0.9x	0.77	x	0.65	x	46.75	x	0.63	x	0.7	=	9.29	(78)
South	0.9x	0.77	x	0.35	x	46.75	x	0.63	x	0.7	=	10	(78)
South	0.9x	0.77	x	0.32	x	76.57	x	0.63	x	0.7	=	14.98	(78)
South	0.9x	0.77	x	0.35	x	76.57	x	0.63	x	0.7	=	16.38	(78)
South	0.9x	0.77	x	0.65	x	76.57	x	0.63	x	0.7	=	15.21	(78)
South	0.9x	0.77	x	0.35	x	76.57	x	0.63	x	0.7	=	16.38	(78)
South	0.9x	0.77	x	0.32	x	97.53	x	0.63	x	0.7	=	19.08	(78)
South	0.9x	0.77	x	0.35	x	97.53	x	0.63	x	0.7	=	20.87	(78)
South	0.9x	0.77	x	0.65	x	97.53	x	0.63	x	0.7	=	19.37	(78)
South	0.9x	0.77	x	0.35	x	97.53	x	0.63	x	0.7	=	20.87	(78)

TER WorkSheet: New dwelling design stage

South	0.9x	0.77	x	0.32	x	110.23	x	0.63	x	0.7	=	21.56	(78)
South	0.9x	0.77	x	0.35	x	110.23	x	0.63	x	0.7	=	23.58	(78)
South	0.9x	0.77	x	0.65	x	110.23	x	0.63	x	0.7	=	21.9	(78)
South	0.9x	0.77	x	0.35	x	110.23	x	0.63	x	0.7	=	23.58	(78)
South	0.9x	0.77	x	0.32	x	114.87	x	0.63	x	0.7	=	22.47	(78)
South	0.9x	0.77	x	0.35	x	114.87	x	0.63	x	0.7	=	24.57	(78)
South	0.9x	0.77	x	0.65	x	114.87	x	0.63	x	0.7	=	22.82	(78)
South	0.9x	0.77	x	0.35	x	114.87	x	0.63	x	0.7	=	24.57	(78)
South	0.9x	0.77	x	0.32	x	110.55	x	0.63	x	0.7	=	21.62	(78)
South	0.9x	0.77	x	0.35	x	110.55	x	0.63	x	0.7	=	23.65	(78)
South	0.9x	0.77	x	0.65	x	110.55	x	0.63	x	0.7	=	21.96	(78)
South	0.9x	0.77	x	0.35	x	110.55	x	0.63	x	0.7	=	23.65	(78)
South	0.9x	0.77	x	0.32	x	108.01	x	0.63	x	0.7	=	21.13	(78)
South	0.9x	0.77	x	0.35	x	108.01	x	0.63	x	0.7	=	23.11	(78)
South	0.9x	0.77	x	0.65	x	108.01	x	0.63	x	0.7	=	21.46	(78)
South	0.9x	0.77	x	0.35	x	108.01	x	0.63	x	0.7	=	23.11	(78)
South	0.9x	0.77	x	0.32	x	104.89	x	0.63	x	0.7	=	20.52	(78)
South	0.9x	0.77	x	0.35	x	104.89	x	0.63	x	0.7	=	22.44	(78)
South	0.9x	0.77	x	0.65	x	104.89	x	0.63	x	0.7	=	20.84	(78)
South	0.9x	0.77	x	0.35	x	104.89	x	0.63	x	0.7	=	22.44	(78)
South	0.9x	0.77	x	0.32	x	101.89	x	0.63	x	0.7	=	19.93	(78)
South	0.9x	0.77	x	0.35	x	101.89	x	0.63	x	0.7	=	21.8	(78)
South	0.9x	0.77	x	0.65	x	101.89	x	0.63	x	0.7	=	20.24	(78)
South	0.9x	0.77	x	0.35	x	101.89	x	0.63	x	0.7	=	21.8	(78)
South	0.9x	0.77	x	0.32	x	82.59	x	0.63	x	0.7	=	16.15	(78)
South	0.9x	0.77	x	0.35	x	82.59	x	0.63	x	0.7	=	17.67	(78)
South	0.9x	0.77	x	0.65	x	82.59	x	0.63	x	0.7	=	16.41	(78)
South	0.9x	0.77	x	0.35	x	82.59	x	0.63	x	0.7	=	17.67	(78)
South	0.9x	0.77	x	0.32	x	55.42	x	0.63	x	0.7	=	10.84	(78)
South	0.9x	0.77	x	0.35	x	55.42	x	0.63	x	0.7	=	11.86	(78)
South	0.9x	0.77	x	0.65	x	55.42	x	0.63	x	0.7	=	11.01	(78)
South	0.9x	0.77	x	0.35	x	55.42	x	0.63	x	0.7	=	11.86	(78)
South	0.9x	0.77	x	0.32	x	40.4	x	0.63	x	0.7	=	7.9	(78)
South	0.9x	0.77	x	0.35	x	40.4	x	0.63	x	0.7	=	8.64	(78)
South	0.9x	0.77	x	0.65	x	40.4	x	0.63	x	0.7	=	8.03	(78)
South	0.9x	0.77	x	0.35	x	40.4	x	0.63	x	0.7	=	8.64	(78)
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	1.28	x	38.42	x	0.63	x	0.7	=	15.03	(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	1.28	x	92.28	x	0.63	x	0.7	=	36.1	(80)
West	0.9x	0.77	x	1.28	x	113.09	x	0.63	x	0.7	=	44.24	(80)

TER WorkSheet: New dwelling design stage

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	1.28	x	110.22	x	0.63	x	0.7	=	43.12	(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	1.28	x	73.59	x	0.63	x	0.7	=	28.79	(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	1.28	x	24.49	x	0.63	x	0.7	=	9.58	(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=	144.15	259.33	386.92	525.85	626.04	636.38	607.45	531.38	435.32	295.7	175.28	121.61	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	579.17	692.25	805.95	922.4	999.71	988.02	944.78	874.75	790.23	673.3	578.97	544.93	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.95	0.87	0.73	0.58	0.64	0.85	0.97	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.27	19.47	19.8	20.24	20.62	20.87	20.96	20.95	20.75	20.24	19.68	19.24	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.61	19.61	19.62	19.63	19.63	19.64	19.64	19.64	19.63	19.63	19.62	19.62	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.97	0.93	0.82	0.62	0.42	0.47	0.77	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=	17.36	17.65	18.14	18.76	19.27	19.56	19.62	19.62	19.44	18.78	17.96	17.32	(90)

fLA = Living area ÷ (4) = 0.31 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	17.96	18.22	18.66	19.22	19.69	19.97	20.04	20.03	19.85	19.24	18.5	17.92	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	17.96	18.22	18.66	19.22	19.69	19.97	20.04	20.03	19.85	19.24	18.5	17.92	(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	0.47	0.53	0.78	0.95	0.99	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	574.8	681.86	779.46	849.43	821.95	643.69	442.69	459.51	619.61	636.91	570.87	541.65	(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=	1848.18	1799.31	1639.07	1379.56	1066.67	711.35	456.36	480.91	764.06	1152.76	1526.09	1842.96	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	947.39	750.93	639.55	381.7	182.07	0	0	0	0	383.79	687.76	968.17	

TER WorkSheet: New dwelling design stage

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	4941.36	(98)
Space heating requirement in kWh/m²/year	58.48	(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)												
947.39	750.93	639.55	381.7	182.07	0	0	0	0	383.79	687.76	968.17	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)												(211)
1013.26	803.13	684.01	408.23	194.73	0	0	0	0	410.47	735.57	1035.48	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$=	5284.87	(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)

203.54	179.43	188.5	169.06	165.74	148.18	142.4	156.14	155.82	175.31	185.26	198.68

Efficiency of water heater	79.8	(216)

(217)m=	88.4	88.22	87.82	86.92	85.06	79.8	79.8	79.8	79.8	86.85	88	88.48

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	230.24	203.39	214.65	194.5	194.84	185.69	178.44	195.66	195.27	201.85	210.53	224.54

Total = Sum(219a)$_{1...12}$ =	2429.61	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		5284.87	
Water heating fuel used		2429.61	
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		359.85	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		8149.33	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year

TER WorkSheet: New dwelling design stage

Space heating (main system 1)	(211) x	0.216	=	1141.53	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	524.8	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1666.33	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	186.76	(268)
Total CO2, kg/year	sum of (265)…(271) =			1892.02	(272)

TER = 33.24 (273)