

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 23 August 2022 at 09:47:02

Project Information:

Assessed By: ()

Building Type: Flat

Dwelling Details:

NEW EXTENSION TO EXISTING DWELLING

Total Floor Area: 58.44m²

Site Reference : 63 London Street

Plot Reference: 63 London Street Loft (gas)

Address : 63, London Street, Reading, RG1 4PS

Client Details:

Name: The Complete Building Regs Service

Address : Tumbledown Cottage, Churchstanton, Taunton, TA3 7RL

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)

22.41 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

29.03 kg/m²

Fail

Excess emissions = 6.62 kg/m² (29.5 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

63.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE)

92.8 kWh/m²

Fail

Excess energy = 29.63 kg/m² (46.9 %)

2 Fabric U-values

Element

Average

Highest

External wall

0.17 (max. 0.30)

0.18 (max. 0.70)

Floor

(no floor)

Roof

0.15 (max. 0.20)

0.15 (max. 0.35)

Openings

1.27 (max. 2.00)

1.50 (max. 3.30)

OK

OK

OK

2a Thermal bridging

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

3 Air permeability

Air permeability at 50 pascals

15.00

OK

4 Heating efficiency

Main Heating system:

Database: (rev 504, product index 018121):

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Ideal

Model: LOGIC CODE COMBI ESP1

Model qualifier: 26

(Combi)

Efficiency 89.6 % SEDBUK2009

Minimum 88.0 %

OK

Secondary heating system:

None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

No cylinder
Boiler interlock: Yes **OK**

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

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

Based on:

Overshading: Average or unknown
Windows facing: West 1.08m²
Windows facing: West 1.08m²
Windows facing: West 1.08m²
Windows facing: East 1.08m²
Windows facing: East 1.08m²
Windows facing: East 1.08m²
Ventilation rate: 3.00

10 Key features

None

Developer Confirmation Report

Property Details: 63 London Street Loft (gas)

Address: 63, London Street, Reading, RG1 4PS
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 23 August 2022
Date of certificate: 23 August 2022
Assessment type: New extension to existing dwelling
Transaction type: None of the above
Thermal Mass Parameter: Indicative Value Medium
Comments:

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022
Front of dwelling faces: North
Comments:

Opening types:

Name:	Type:	Frame Factor:	g-value:	U-Value:	Area:
D1	Solid	0.7	0	1.5	1.89
w1	Windows	0.7	0.6	1.2	1.08
w2	Windows	0.7	0.6	1.2	1.08
w3	Windows	0.7	0.6	1.2	1.08
w4	Windows	0.7	0.6	1.2	1.08
w5	Windows	0.7	0.6	1.2	1.08
w6	Windows	0.7	0.6	1.2	1.08

Overshading: Average or unknown
Comments:

Opaque Elements:

Type:	U-Value:	Kappa:
<u>External Elements</u>		
walls	0.18 Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A
dormer cheeks	0.18 Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A

Developer Confirmation Report

Wall to corridor	0.18	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A
Roof	0.15	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A
<u>Internal Elements (Area, Kappa)</u>			
int wall	22.16		N/A
Comments:			

Int floor	58.44		N/A
Comments:			

Party Elements (Area, Kappa)

Thermal bridges:

Thermal bridges:	No information on thermal bridging (y=0.15) (y =0.15)
Comments:	

If specific construction details have been adopted then please provide the associated checklists; signed and dated.

Ventilation:

Pressure test:	No (Assumed)
Ventilation:	Natural ventilation (extract fans)
Pressure test:	15
Comments:	

Please provide the pressure test certificate, or certificates if the result is based on an average; signed and dated.

Main heating system:

Main heating system:	Boiler systems with radiators or underfloor heating
	Gas boilers and oil boilers
	Fuel: mains gas
	Info Source: Boiler Database
	Database: (rev 504, product index 018121) Efficiency: Winter 87.3 % Summer: 90.5
	Has integral PFGHRD
	Brand name: Ideal
	Model: LOGIC CODE COMBI ESP1
	Model qualifier: 26
	(Combi boiler)
	Systems with radiators

Developer Confirmation Report

Central heating pump : 2013 or later
Design flow temperature: Design flow temperature >45°C
Boiler interlock: Yes
Delayed start

Comments:

Main heating Control:

Main heating Control:

Time and temperature zone control by suitable arrangement of plumbing and electrical services

Comments:

Secondary heating system:

Secondary heating system: None

Comments:

Water heating:

Water heating: No hot water cylinder

Comments:

Flue Gas Heat Recovery System:
Database (rev 504, product index)
Solar panel: False

Others:

Electricity tariff: Standard Tariff
Low energy lights: 100%
Terrain type: Low rise urban / suburban
Wind turbine: No
Photovoltaics: None

Comments:

Please provide the MCS certificate or data sheet equivalent confirming the size of the array on the roof. This should include any calculations to support a proportioned amount included in the assessment.

Developer Confirmation Report

Declaration :

I confirm that the property has been built to the above specification.

Signed:

.....

Date:

.....

SAP Input

Property Details: 63 London Street Loft (gas)

Address: 63, London Street, Reading, RG1 4PS
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 23 August 2022
Date of certificate: 23 August 2022
Assessment type: New extension to existing dwelling
Transaction type: None of the above
Tenure type: Rented (private)
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 504

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022
Floor Location: Floor area:
Storey height:
 Floor 0 58.44 m² 2.89 m

Living area: 28.18 m² (fraction 0.482)
Front of dwelling faces: North

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D1	Manufacturer	Solid			Wood
w1	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w2	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w3	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w4	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w5	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w6	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
D1	mm	0.7	0	1.5	1.89	1
w1	16mm or more	0.7	0.6	1.2	1.08	1
w2	16mm or more	0.7	0.6	1.2	1.08	1
w3	16mm or more	0.7	0.6	1.2	1.08	1
w4	16mm or more	0.7	0.6	1.2	1.08	1
w5	16mm or more	0.7	0.6	1.2	1.08	1
w6	16mm or more	0.7	0.6	1.2	1.08	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D1		walls	North	0	0
w1		walls	West	0	0
w2		walls	West	0	0
w3		walls	West	0	0
w4		walls	East	0	0
w5		walls	East	0	0
w6		walls	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:

SAP Input

External Elements

walls	61.6	8.37	53.23	0.18	0	False	N/A
dormer cheeks	2.88	0	2.88	0.18	0	False	N/A
Wall to corridor	26	0	26	0.18	0.9	False	N/A
Roof	58.44	0	58.44	0.15	0		N/A

Internal Elements

int wall	22.16						N/A
Int floor	58.44						N/A

Party Elements

Thermal bridges:

Thermal bridges: No information on thermal bridging (y=0.15) (y =0.15)

Ventilation:

Pressure test: No (Assumed)
 Ventilation: Natural ventilation (extract fans)
 Number of chimneys: 0
 Number of open flues: 0
 Number of fans: 2
 Number of passive stacks: 0
 Number of sides sheltered: 0
 Pressure test: 15

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating
 Gas boilers and oil boilers
 Fuel: mains gas
 Info Source: Boiler Database
 Database: (rev 504, product index 018121) Efficiency: Winter 87.3 % Summer: 90.5
 Has integral PFGHRD
 Brand name: Ideal
 Model: LOGIC CODE COMBI ESP1
 Model qualifier: 26
 (Combi boiler)
 Systems with radiators
 Central heating pump : 2013 or later
 Design flow temperature: Design flow temperature >45°C
 Boiler interlock: Yes
 Delayed start

Main heating Control:

Main heating Control: Time and temperature zone control by suitable arrangement of plumbing and electrical services
 Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system
 Water code: 901
 Fuel :mains gas
 No hot water cylinder
 Flue Gas Heat Recovery System:
 Database (rev 504, product index)
 Solar panel: False

Others:

Electricity tariff: Standard Tariff
 In Smoke Control Area: Yes

SAP Input

Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

DRAFT

SAP WorkSheet: New extension to existing dwelling

User Details:

Assessor Name:

Stroma Number:

Software Name: Stroma FSAP 2012

Software Version:

Version: 1.0.5.53

Property Address: 63 London Street Loft (gas)

Address : 63, London Street, Reading, RG1 4PS

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	58.44 (1a)	2.89 (2a)	168.89 (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	58.44 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	168.89 (5)

2. Ventilation rate:

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

	Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.12 (8)

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

Number of storeys in the dwelling (ns) 0 (9)

Additional infiltration [(9)-1]x0.1 = 0 (10)

Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)

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

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)

If no draught lobby, enter 0.05, else enter 0 0 (13)

Percentage of windows and doors draught stripped 0 (14)

Window infiltration 0.25 - [0.2 x (14) ÷ 100] = 0 (15)

Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 15 (17)

If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16) 0.87 (18)

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

Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1 (20)

Infiltration rate incorporating shelter factor (21) = (18) x (20) = 0.87 (21)

Infiltration rate modified for monthly wind speed

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

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

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18
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SAP WorkSheet: New extension to existing dwelling

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

1.11	1.09	1.06	0.96	0.93	0.82	0.82	0.8	0.87	0.93	0.98	1.02
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

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

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

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

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

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

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

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

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

(24d)m= 1.11 1.09 1.06 0.96 0.94 0.84 0.84 0.82 0.88 0.94 0.98 1.02 (24d)

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

(25)m= 1.11 1.09 1.06 0.96 0.94 0.84 0.84 0.82 0.88 0.94 0.98 1.02 (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 1.5	= 2.835		(26)
Windows Type 1			1.08	x 1/[1/(1.2)+0.04]	= 1.24		(27)
Windows Type 2			1.08	x 1/[1/(1.2)+0.04]	= 1.24		(27)
Windows Type 3			1.08	x 1/[1/(1.2)+0.04]	= 1.24		(27)
Windows Type 4			1.08	x 1/[1/(1.2)+0.04]	= 1.24		(27)
Windows Type 5			1.08	x 1/[1/(1.2)+0.04]	= 1.24		(27)
Windows Type 6			1.08	x 1/[1/(1.2)+0.04]	= 1.24		(27)
Walls Type1	61.6	8.37	53.23	x 0.18	= 9.58		(29)
Walls Type2	2.88	0	2.88	x 0.18	= 0.52		(29)
Walls Type3	26	0	26	x 0.15	= 4.03		(29)
Roof	58.44	0	58.44	x 0.15	= 8.77		(30)
Total area of elements, m²			148.92				(31)
Internal wall **			22.16				(32c)
Internal floor			58.44				(32d)

* 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) = 33.15 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 8837.82 (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

SAP WorkSheet: New extension to existing dwelling

can be used instead of a detailed calculation.

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

22.34 (36)

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

Total fabric heat loss

(33) + (36) =

55.49 (37)

Ventilation heat loss calculated monthly

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

(38)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
61.71	60.5	59.29	53.3	52.15	46.83	46.83	45.85	48.88	52.15	54.47	56.87

(38)

Heat transfer coefficient, W/K

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

(39)m=

117.2	115.99	114.78	108.78	107.64	102.32	102.32	101.34	104.37	107.64	109.95	112.36
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Average = Sum(39)_{1...12} /12=

108.72 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

2.01	1.98	1.96	1.86	1.84	1.75	1.75	1.73	1.79	1.84	1.88	1.92
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Average = Sum(40)_{1...12} /12=

1.86 (40)

Number of days in month (Table 1a)

(41)m=

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

(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

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

if TFA ≤ 13.9, N = 1

1.94 (42)

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

80.21 (43)

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

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

(44)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
88.23	85.02	81.81	78.6	75.4	72.19	72.19	75.4	78.6	81.81	85.02	88.23

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

962.5 (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=

130.84	114.43	118.09	102.95	98.78	85.24	78.99	90.64	91.72	106.9	116.69	126.71
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Total = Sum(45)_{1...12} =

1261.99 (45)

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

(46)m=

19.63	17.17	17.71	15.44	14.82	12.79	11.85	13.6	13.76	16.03	17.5	19.01
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(46)

Water storage loss:

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

0

(47)

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

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

Water storage loss:

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

0

(48)

Temperature factor from Table 2b

0

(49)

Energy lost from water storage, kWh/year

(48) x (49) =

0

(50)

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

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

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

SAP WorkSheet: New extension to existing dwelling

Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0
0

(54)

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

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=

0	0	0	0	0	0	0	0	0	0	0	0
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(56)

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

(57)m=

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

(57)

Primary circuit loss (annual) from Table 3

0

(58)

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

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

(59)m=

0	0	0	0	0	0	0	0	0	0	0	0
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(59)

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

(61)m=

3.05	2.75	3.05	2.95	3.05	2.95	3.05	3.05	2.95	3.05	2.95	3.05
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(61)

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

(62)m=

133.89	117.19	121.13	105.9	101.83	88.19	82.04	93.69	94.67	109.94	119.63	129.76
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(62)

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

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=

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

(63)

FGHRs

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

(63) (G2)

Output from water heater

(64)m=

133.89	117.19	121.13	105.9	101.83	88.19	82.04	93.69	94.67	109.94	119.63	129.76
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Output from water heater (annual)_{1...12}

1297.86 (64)

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

(65)m=

44.27	38.74	40.03	34.97	33.61	29.08	27.03	30.9	31.24	36.3	39.53	42.89
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(65)

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

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

Metabolic gains (Table 5), Watts

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
116.23	116.23	116.23	116.23	116.23	116.23	116.23	116.23	116.23	116.23	116.23	116.23

(66)

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

(67)m=

40.82	36.26	29.49	22.32	16.69	14.09	15.22	19.79	26.56	33.72	39.36	41.96
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(67)

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

(68)m=

252.23	254.85	248.25	234.21	216.49	199.83	188.7	186.08	192.68	206.72	224.44	241.1
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	-------

(68)

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

(69)m=

48.56	48.56	48.56	48.56	48.56	48.56	48.56	48.56	48.56	48.56	48.56	48.56
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=

-77.49	-77.49	-77.49	-77.49	-77.49	-77.49	-77.49	-77.49	-77.49	-77.49	-77.49	-77.49
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(71)

Water heating gains (Table 5)

(72)m=

59.5	57.64	53.8	48.57	45.17	40.39	36.32	41.53	43.38	48.8	54.91	57.65
------	-------	------	-------	-------	-------	-------	-------	-------	------	-------	-------

(72)

Total internal gains =

$$(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$$

(73)m=

442.86	439.06	421.85	395.41	368.65	344.61	330.55	337.71	352.92	379.54	409.02	431.02
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(73)

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6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c	=	Gains (W)	
East	0.9x	1	x	1.08	x	19.64	x	0.6	x	0.7	=	8.02 (76)
East	0.9x	1	x	1.08	x	19.64	x	0.6	x	0.7	=	8.02 (76)
East	0.9x	1	x	1.08	x	19.64	x	0.6	x	0.7	=	8.02 (76)
East	0.9x	1	x	1.08	x	38.42	x	0.6	x	0.7	=	15.68 (76)
East	0.9x	1	x	1.08	x	38.42	x	0.6	x	0.7	=	15.68 (76)
East	0.9x	1	x	1.08	x	38.42	x	0.6	x	0.7	=	15.68 (76)
East	0.9x	1	x	1.08	x	63.27	x	0.6	x	0.7	=	25.83 (76)
East	0.9x	1	x	1.08	x	63.27	x	0.6	x	0.7	=	25.83 (76)
East	0.9x	1	x	1.08	x	63.27	x	0.6	x	0.7	=	25.83 (76)
East	0.9x	1	x	1.08	x	92.28	x	0.6	x	0.7	=	37.67 (76)
East	0.9x	1	x	1.08	x	92.28	x	0.6	x	0.7	=	37.67 (76)
East	0.9x	1	x	1.08	x	92.28	x	0.6	x	0.7	=	37.67 (76)
East	0.9x	1	x	1.08	x	113.09	x	0.6	x	0.7	=	46.17 (76)
East	0.9x	1	x	1.08	x	113.09	x	0.6	x	0.7	=	46.17 (76)
East	0.9x	1	x	1.08	x	113.09	x	0.6	x	0.7	=	46.17 (76)
East	0.9x	1	x	1.08	x	115.77	x	0.6	x	0.7	=	47.26 (76)
East	0.9x	1	x	1.08	x	115.77	x	0.6	x	0.7	=	47.26 (76)
East	0.9x	1	x	1.08	x	115.77	x	0.6	x	0.7	=	47.26 (76)
East	0.9x	1	x	1.08	x	110.22	x	0.6	x	0.7	=	45 (76)
East	0.9x	1	x	1.08	x	110.22	x	0.6	x	0.7	=	45 (76)
East	0.9x	1	x	1.08	x	110.22	x	0.6	x	0.7	=	45 (76)
East	0.9x	1	x	1.08	x	94.68	x	0.6	x	0.7	=	38.65 (76)
East	0.9x	1	x	1.08	x	94.68	x	0.6	x	0.7	=	38.65 (76)
East	0.9x	1	x	1.08	x	94.68	x	0.6	x	0.7	=	38.65 (76)
East	0.9x	1	x	1.08	x	73.59	x	0.6	x	0.7	=	30.04 (76)
East	0.9x	1	x	1.08	x	73.59	x	0.6	x	0.7	=	30.04 (76)
East	0.9x	1	x	1.08	x	73.59	x	0.6	x	0.7	=	30.04 (76)
East	0.9x	1	x	1.08	x	45.59	x	0.6	x	0.7	=	18.61 (76)
East	0.9x	1	x	1.08	x	45.59	x	0.6	x	0.7	=	18.61 (76)
East	0.9x	1	x	1.08	x	45.59	x	0.6	x	0.7	=	18.61 (76)
East	0.9x	1	x	1.08	x	24.49	x	0.6	x	0.7	=	10 (76)
East	0.9x	1	x	1.08	x	24.49	x	0.6	x	0.7	=	10 (76)
East	0.9x	1	x	1.08	x	24.49	x	0.6	x	0.7	=	10 (76)
East	0.9x	1	x	1.08	x	16.15	x	0.6	x	0.7	=	6.59 (76)
East	0.9x	1	x	1.08	x	16.15	x	0.6	x	0.7	=	6.59 (76)
East	0.9x	1	x	1.08	x	16.15	x	0.6	x	0.7	=	6.59 (76)

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West	0.9x	1	x	1.08	x	19.64	x	0.6	x	0.7	=	8.02	(80)
West	0.9x	1	x	1.08	x	19.64	x	0.6	x	0.7	=	8.02	(80)
West	0.9x	1	x	1.08	x	19.64	x	0.6	x	0.7	=	8.02	(80)
West	0.9x	1	x	1.08	x	38.42	x	0.6	x	0.7	=	15.68	(80)
West	0.9x	1	x	1.08	x	38.42	x	0.6	x	0.7	=	15.68	(80)
West	0.9x	1	x	1.08	x	38.42	x	0.6	x	0.7	=	15.68	(80)
West	0.9x	1	x	1.08	x	63.27	x	0.6	x	0.7	=	25.83	(80)
West	0.9x	1	x	1.08	x	63.27	x	0.6	x	0.7	=	25.83	(80)
West	0.9x	1	x	1.08	x	63.27	x	0.6	x	0.7	=	25.83	(80)
West	0.9x	1	x	1.08	x	92.28	x	0.6	x	0.7	=	37.67	(80)
West	0.9x	1	x	1.08	x	92.28	x	0.6	x	0.7	=	37.67	(80)
West	0.9x	1	x	1.08	x	92.28	x	0.6	x	0.7	=	37.67	(80)
West	0.9x	1	x	1.08	x	113.09	x	0.6	x	0.7	=	46.17	(80)
West	0.9x	1	x	1.08	x	113.09	x	0.6	x	0.7	=	46.17	(80)
West	0.9x	1	x	1.08	x	113.09	x	0.6	x	0.7	=	46.17	(80)
West	0.9x	1	x	1.08	x	115.77	x	0.6	x	0.7	=	47.26	(80)
West	0.9x	1	x	1.08	x	115.77	x	0.6	x	0.7	=	47.26	(80)
West	0.9x	1	x	1.08	x	115.77	x	0.6	x	0.7	=	47.26	(80)
West	0.9x	1	x	1.08	x	110.22	x	0.6	x	0.7	=	45	(80)
West	0.9x	1	x	1.08	x	110.22	x	0.6	x	0.7	=	45	(80)
West	0.9x	1	x	1.08	x	110.22	x	0.6	x	0.7	=	45	(80)
West	0.9x	1	x	1.08	x	94.68	x	0.6	x	0.7	=	38.65	(80)
West	0.9x	1	x	1.08	x	94.68	x	0.6	x	0.7	=	38.65	(80)
West	0.9x	1	x	1.08	x	94.68	x	0.6	x	0.7	=	38.65	(80)
West	0.9x	1	x	1.08	x	73.59	x	0.6	x	0.7	=	30.04	(80)
West	0.9x	1	x	1.08	x	73.59	x	0.6	x	0.7	=	30.04	(80)
West	0.9x	1	x	1.08	x	73.59	x	0.6	x	0.7	=	30.04	(80)
West	0.9x	1	x	1.08	x	45.59	x	0.6	x	0.7	=	18.61	(80)
West	0.9x	1	x	1.08	x	45.59	x	0.6	x	0.7	=	18.61	(80)
West	0.9x	1	x	1.08	x	45.59	x	0.6	x	0.7	=	18.61	(80)
West	0.9x	1	x	1.08	x	24.49	x	0.6	x	0.7	=	10	(80)
West	0.9x	1	x	1.08	x	24.49	x	0.6	x	0.7	=	10	(80)
West	0.9x	1	x	1.08	x	24.49	x	0.6	x	0.7	=	10	(80)
West	0.9x	1	x	1.08	x	16.15	x	0.6	x	0.7	=	6.59	(80)
West	0.9x	1	x	1.08	x	16.15	x	0.6	x	0.7	=	6.59	(80)
West	0.9x	1	x	1.08	x	16.15	x	0.6	x	0.7	=	6.59	(80)

Solar gains in watts, calculated for each month

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

(83)m= 48.11 94.11 154.98 226.03 277.01 283.57 269.97 231.9 180.25 111.67 59.98 39.56 (83)

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

(84)m= 490.97 533.17 576.83 621.44 645.67 628.18 600.53 569.61 533.18 491.21 469 470.58 (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
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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(86)m=	0.99	0.99	0.98	0.96	0.91	0.8	0.66	0.7	0.88	0.97	0.99	0.99	(86)
--------	------	------	------	------	------	-----	------	-----	------	------	------	------	------

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

(87)m=	18.96	19.13	19.46	19.98	20.41	20.78	20.92	20.9	20.64	20.08	19.49	19	(87)
--------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	----	------

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

(88)m=	19.33	19.34	19.36	19.43	19.44	19.5	19.52	19.48	19.44	19.41	19.39	(88)
--------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	------

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

(89)m=	0.99	0.98	0.97	0.94	0.87	0.69	0.47	0.52	0.8	0.95	0.98	0.99	(89)
--------	------	------	------	------	------	------	------	------	-----	------	------	------	------

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

(90)m=	16.73	16.99	17.48	18.26	18.87	19.36	19.48	19.48	19.2	18.43	17.56	16.83	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	------

fLA = Living area ÷ (4) =	0.48	(91)
---------------------------	------	------

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

(92)m=	17.8	18.02	18.44	19.09	19.61	20.04	20.18	20.17	19.89	19.22	18.49	17.87	(92)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	17.65	17.87	18.29	18.94	19.46	19.89	20.03	20.02	19.74	19.07	18.34	17.72	(93)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.97	0.93	0.87	0.72	0.55	0.59	0.82	0.94	0.98	0.99	(94)

Useful gains, hmGm, W = (94)m × (84)m

(95)m=	483.64	522.2	557.45	580.69	559.4	454.3	328.13	336.76	436.88	463.77	458.69	464.57	(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 × ((93)m – (96)m)]

(97)m=	1565.09	1504.83	1352.99	1091.96	835.5	541.69	350.46	366.44	588.98	912.21	1235.88	1519.58	(97)
--------	---------	---------	---------	---------	-------	--------	--------	--------	--------	--------	---------	---------	------

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

(98)m=	804.6	660.32	591.88	368.12	205.41	0	0	0	0	333.64	559.58	784.93	(98)
--------	-------	--------	--------	--------	--------	---	---	---	---	--------	--------	--------	------

Total per year (kWh/year) = Sum(98) _{1...5,9...12} =	4308.48	(98)
---	---------	------

Space heating requirement in kWh/m²/year

73.72	(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

90.5	(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)

(211)m = {[(98)m × (204)]} × 100 ÷ (206)												(211)
889.06	729.64	654.02	406.76	226.98	0	0	0	0	368.66	618.32	867.33	

Total (kWh/year) = Sum(211) _{1...5,10...12} =	4760.75	(211)
--	---------	-------

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Space heating fuel (secondary), kWh/month

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

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

Water heating

Output from water heater (calculated above)

	133.89	117.19	121.13	105.9	101.83	88.19	82.04	93.69	94.67	109.94	119.63	129.76		
Efficiency of water heater													87.3	(216)
(217)m=	90.03	90	89.94	89.76	89.41	87.3	87.3	87.3	87.3	89.69	89.92	90.03		(217)

Fuel for water heating, kWh/month

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

(219)m=	148.72	130.2	134.68	117.97	113.89	101.02	93.97	107.32	108.45	122.59	133.05	144.13		
Total = Sum(219a) _{1...12} =													1455.97	(219)

Annual totals

Space heating fuel used, main system 1

kWh/year

kWh/year

4760.75

Water heating fuel used

1455.97

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

$$\text{sum of (230a)...(230g) =}$$

75

(231)

Electricity for lighting

288.39

(232)

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

6580.12

(238)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.48	x 0.01 = 165.67 (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)
Water heating cost (other fuel)	(219)	3.48	x 0.01 = 50.67 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 = 9.89 (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 = 38.04 (250)
Additional standing charges (Table 12)			120 (251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)...(254) = 384.27 (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] =	1.56 (257)
SAP rating (Section 12)		78.23 (258)

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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	1028.32 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	314.49 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1342.81 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	38.93 (267)
Electricity for lighting	(232) x	0.519	149.68 (268)
Total CO2, kg/year		sum of (265)...(271) =	1531.41 (272)
CO2 emissions per m²		(272) ÷ (4) =	26.2 (273)
EI rating (section 14)			80 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22	5808.12 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22	1776.28 (264)
Space and water heating	(261) + (262) + (263) + (264) =		7584.4 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	230.25 (267)
Electricity for lighting	(232) x	0	885.36 (268)
Total Primary Energy		sum of (265)...(271) =	8700.02 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	148.87 (273)