### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8 Printed on 07 October 2020 at 14:40:05

Project Information:

Assessed By: John Ashe (STRO031268) **Building Type:** Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** 

Total Floor Area: 78.72m<sup>2</sup>

Site Reference : COPPETTS WOOD, London Plot Reference: Unit 7 - COPPETTS WOOD, Lor

Address:

Client Details:

Name:

Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c), Mains gas (c)

Fuel factor: 1.00 (mains gas (c), mains gas (c))

15.23 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 8.99 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.2 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 35.5 kWh/m<sup>2</sup>

OK

2 Fabric U-values

| Element       | Average          | Highest          |    |
|---------------|------------------|------------------|----|
| External wall | 0.15 (max. 0.30) | 0.15 (max. 0.70) | OK |
| Floor         | 0.13 (max. 0.25) | 0.13 (max. 0.70) | OK |
| Roof          | (no roof)        |                  |    |
| Openings      | 0.90 (max. 2.00) | 0.90 (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)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Community boilers

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

# **Regulations Compliance Report**

| 7 Low energy lights                                 |                    |    |
|---|--------------------|----|
| Percentage of fixed lights with low-energy fittings | 100.0%             |    |
| Minimum   | 75.0%              | OK |
| 3 Mechanical ventilation                            |                    |    |
| Continuous supply and extract system                |                    |    |
| Specific fan power:                                 | 0.9                |    |
| Maximum   | 1.5                | OK |
| MVHR efficiency:                                    | 91%                |    |
| Minimum   | 70%                | OK |
| 9 Summertime temperature                            |                    |    |
| Overheating risk (Thames valley):                   | Medium             | ок |
| ased on:  |                    |    |
| Overshading:  | Average or unknown |    |
| Windows facing: South                               | 12.15m²            |    |
| Ventilation rate:                                   | 4.00               |    |
|   |                    |    |
| 10 Key features                                     |                    |    |
| Windows U-value                                     | 0.9 W/m²K          |    |

Community heating, heat from boilers - mains gas

Photovoltaic array

## **Thermal Bridge Report**

Property Details: Unit 7 - COPPETTS WOOD, London

Address:

Located in: England Region: Thames valley

Thermal bridges:

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

### **Predicted Energy Assessment**

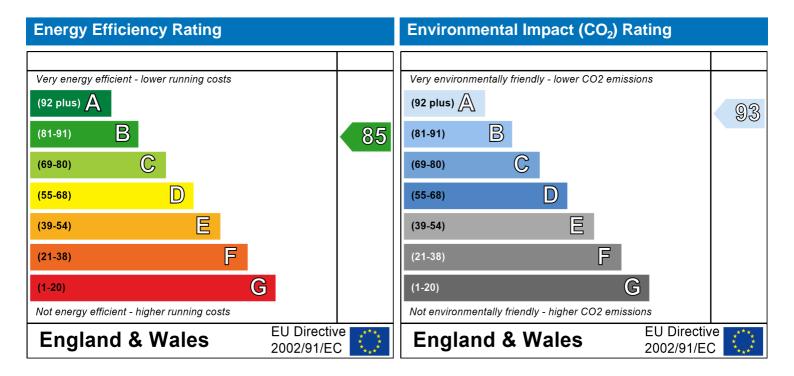


Dwelling type: Date of assessment: Produced by: Total floor area: Mid floor Flat 30 September 2020 John Ashe

78.72 m<sup>2</sup>

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.



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.

### **Developer Confirmation Report**

#### Property Details: Unit 7 - COPPETTS WOOD, London

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 30 September 2020 Date of certificate: 07 October 2020

Assessment type: New dwelling design stage

Transaction type: New dwelling

Thermal Mass Parameter: Indicative Value Low

Comments:

#### Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020 Front of dwelling faces: North

Comments:

#### Opening types:

Name: Type: Frame Factor: g-value: U-Value: Area: Rear Windows Windows 0.7 0.63 0.9 12.15

Overshading: Average or unknown

Comments:

#### Opaque Elements:

Type: U-Value: Kappa:

**External Elements** 

Walls
0.15 Please provide the U-Value calculation to justify the U-Value entered into the assessment.

N/A
Exposed Floor
0.13 Please provide the U-Value calculation to justify the U-Value entered into the assessment.

N/A

Internal Elements (Area, Kappa)
Party Elements (Area, Kappa)

#### Thermal bridges:

# **Developer Confirmation Report**

| Thermal bridges: Comments:                                    | No information on thermal bridging ( $y=0.15$ ) ( $y=0.15$ )   |
|---|--|
| If specific construction details have                         | been adopted then please provide the associated checklists; signed and dated.  |
| Ventilation:  |  |
| Pressure test:<br>Ventilation:                                | Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 2 Ductwork: Insulation, rigid Approved Installation Scheme: True  |
| Pressure test: Comments:                                      | 5  |
| Please provide the pressure test ce                           | rtificate, or certificates if the result is based on an average; signed and dated.   |
| Main heating system:  |  |
| Main heating system:  | Community heating schemes Heat source: Community boilers heat from boilers – mains gas, heat fraction 0.4, efficiency 89 Heat source: Community boilers heat from boilers – mains gas, heat fraction 0.4, efficiency 89 Piping>=1991, pre-insulated, low temp, variable flow |
| Comments:   |  |
|   |  |
| Main heating Control:   |  |
| Main heating Control:   | Charging system linked to use of community heating, programmer and at least two room thermostats   |
| Comments:   |  |
| Carandamahashin masakan                                       |  |
| Secondary heating system: Secondary heating system: Comments: | None   |
|   |  |

# **Developer Confirmation Report**

| Water heating:  |   |
|---|---|
| Water heating:<br>Comments:   | No hot water cylinder   |
|   |   |
|   |   |
|   |   |
|   | Solar panel: False  |
| Others:   | Solai pariei. i aise  |
| Electricity tariff: Low energy lights: Terrain type: Wind turbine: Photovoltaics:  Comments:  Please provide the MCS certificate or include any calculations to support a | Standard Tariff 100% Low rise urban / suburban No Photovoltaic 1 Installed Peak power: 0.89 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South  data sheet equivalent confirming the size of the array on the roof. This should proportioned amount included in the assessment. |
|   |   |
|   |   |
| Declaration:  |   |
| I confirm that the property has been bu<br>Signed:  | uilt to the above specification.  |
| <br>Nate·   |   |
|   |   |

User Details: **Assessor Name:** John Ashe Stroma Number: STRO031268 Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.8 Property Address: Unit 7 - COPPETTS WOOD, London Address: 1. Overall dwelling dimensions Area(m²) Av. Height(m) Volume(m³) Ground floor 78.72 (1a) x (2a) = 209.4 (3a) 2.66 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)78.72 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =209.4 (5) total m³ per hour main secondary other heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 O O 0 0 (6b) Number of intermittent fans x 10 =(7a) 0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div$  (5) = (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) (9) O Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 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 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , 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 (19)0  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)1  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor 0.25 (21)Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr Mav Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.08 0.95 0.95 0.92 1 1.08 1.12 1.1 1.18

| Adjusted infiltr                              | ation rat    | e (allowi           | ing for sh     | nelter an   | d wind s          | speed) =  | (21a) x  | (22a)m      |  |                          |                    |               |               |
|---|--------------|---------------------|----------------|-------------|-------------------|---|--|-------------|--|--------------------------|--------------------|---------------|---------------|
| 0.32  | 0.31         | 0.31                | 0.28           | 0.27        | 0.24              | 0.24  | 0.23   | 0.25        | 0.27   | 0.28                     | 0.29               |               |               |
| Calculate effe                                |              | _                   | rate for t     | he appli    | cable ca          | se  | -  |             |  |                          | •                  |               | <b>—</b> ,,,, |
| If mechanical If exhaust air h                |              |                     | andiv N. (2    | 12h) - (22a | a) Em. (          | aguatian (I   | VEVV otho  | nuico (22h  | ·) - (22a)                                       |                          |                    | 0.5           | (23           |
| If balanced with                              |              | 0                   |                | , ,         | ,                 | . ,   | ,, .   | `           | i) = (23a)                                       |                          |                    | 0.5           | (23           |
|   |              | •                   | •              | ŭ           |                   | `   |  | ,           | Ola )  | 201.)                    | 4 (00)             | 77.35         | (23           |
| a) If balance                                 |              |                     |                | i           |                   | <del>, ` `                                   </del> | <del>- ´ ` -</del>                               | ŕ           | <del>,                                    </del> |                          | <del>- ` ´</del>   | i ÷ 100]<br>I | (24           |
| (24a)m= 0.43                                  | 0.43         | 0.42                | 0.39           | 0.38        | 0.35              | 0.35  | 0.34   | 0.36        | 0.38   | 0.39                     | 0.41               |               | (24           |
| b) If balance                                 |              |                     |                | ı           |                   | <del>,                                    </del>    | <del>,                                    </del> | ŕ           | <u> </u>   |                          | Ι .                | 1             | (24           |
| (24b)m= 0                                     | 0            | 0                   | 0              | 0           | 0                 | 0   | 0  | 0           | 0  | 0                        | 0                  |               | (24           |
| c) If whole h                                 |              |                     |                | •           | •                 |   |  |             | E (22h   | ١                        |                    |               |               |
| (24c)m= 0                                     | 0.5 x        | 0                   | 0              | 0 = (230)   | 0                 | 0   | C) = (221)                                       | 0           | .5 × (23b  | 0                        | 0                  | ]             | (24           |
| ` ′   |              |                     |                |             |                   |   |  |             |  | 0                        | 1 0                |               | (24           |
| d) If natural<br>if (22b)r                    | ventilation  |                     |                | •           |                   |   |  |             | 0.51   |                          |                    |               |               |
| (24d)m= 0                                     | 0            | 0                   | 0              | 0           | 0                 | 0   | 0  | 0           | 0  | 0                        | 0                  | ]             | (24           |
| Effective air                                 | change       | rate - er           | ı<br>nter (24a | ) or (24t   | o) or (24         | c) or (24   | .d) in box                                       | (25)        | <u>.                                    </u>     |                          |                    | I             |               |
| (25)m= 0.43                                   | 0.43         | 0.42                | 0.39           | 0.38        | 0.35              | 0.35  | 0.34   | 0.36        | 0.38   | 0.39                     | 0.41               | ]             | (25           |
| ( )   |              |                     |                |             |                   |   | 1  |             |  |                          | 1 -                |               | `             |
| 3. Heat losse                                 | s and he     | eat loss p          | paramet        | er:         |                   |   |  |             |  |                          |                    |               |               |
| ELEMENT                                       | Gros<br>area |                     | Openin<br>m    |             | Net Ar<br>A ,r    |   | U-valı<br>W/m2                                   |             | A X U<br>(W/l                                    | <)                       | k-value<br>kJ/m²-l |               | X k<br>J/K    |
| Windows                                       |              |                     |                |             | 12.15             | <sub>5</sub> χ1                                     | /[1/( 0.9 )+                                     | 0.04] =     | 10.56  |                          |                    |               | (27           |
| Floor   |              |                     |                |             | 78.72             | 2 X   | 0.13   | =           | 10.2336  | 5 [                      |                    |               | (28           |
| Walls   | 27.3         | 34                  | 12.1           | 5           | 15.19             | ) x   | 0.15   | =           | 2.28   | <b>=</b> [               |                    | $\neg$        | (29           |
| Total area of e                               | elements     | , m²                |                |             | 106.0             | 6   |  |             |  |                          |                    |               | <br>(31       |
| * for windows and                             | l roof wind  | ows, use $\epsilon$ | effective wi   | ndow U-va   | alue calcul       | ated using  | g formula 1                                      | /[(1/U-valu | ue)+0.04] a                                      | s given in               | paragraph          | 1 3.2         |               |
| ** include the area                           |              |                     |                | ls and par  | titions           |   |  |             |  |                          |                    |               |               |
| Fabric heat los                               | 3s, W/K =    | = S (A x            | U)             |             |                   |   | (26)(30)   | + (32) =    |  |                          |                    | 23.07         | (33           |
| Heat capacity                                 | Cm = S(      | $(A \times k)$      |                |             |                   |   |  | ((28).      | (30) + (32                                       | 2) + (32a).              | (32e) =            | 9570.6        | (34           |
| Thermal mass                                  | parame       | ter (TMF            | P = Cm -       | - TFA) ir   | n kJ/m²K          |   |  | Indica      | tive Value:                                      | Low                      |                    | 100           | (35           |
| For design assess                             |              |                     |                | construct   | ion are no        | t known pr  | ecisely the                                      | indicative  | e values of                                      | TMP in Ta                | able 1f            |               |               |
| can be used inste<br>Thormal bridge           |              |                     |                | uoina An    | nondiy l          | /   |  |             |  |                          |                    |               |               |
| Thermal bridger if details of thermaler       | ,            | ,                   |                | • .         | •                 | N.  |  |             |  |                          |                    | 15.91         | (36           |
| Total fabric he                               |              | are not kin         | 10W11 (30) -   | - 0.00 X (3 | 11)               |   |  | (33) +      | (36) =   |                          |                    | 38.98         | (37           |
| Ventilation hea                               |              | alculated           | d monthly      | V           |                   |   |  |             | = 0.33 × (                                       | 25)m x (5)               | )                  | 00.00         | (             |
| Jan   | Feb          | Mar                 | Apr            | May         | Jun               | Jul   | Aug  | Sep         | Oct  | Nov                      | Dec                | 1             |               |
| (38)m= 29.85                                  | 29.42        | 28.99               | 26.83          | 26.4        | 24.24             | 24.24   | 23.81  | 25.1        | 26.4   | 27.26                    | 28.12              |               | (38           |
|   |              |                     | L              |             | ·· <del>_</del> · | ·· <del>-</del> ·                                   | L  | <u> </u>    | <u>.                                    </u>     |                          |                    | J             | (             |
| Heat transfer of                              | 1            |                     | 65.0           | GE 07       | 62.04             | 62.04   | 60.70  |             | = (37) + (37)                                    |                          | 67.4               | 1             |               |
| 200,00  | 68.4         | 67.96               | 65.8           | 65.37       | 63.21             | 63.21   | 62.78  | 64.08       | 65.37  | 66.24                    | 67.1               | 65.7          | (39           |
| (39)m= 68.83                                  |              |                     |                |             |                   |   |  |             |  |                          |                    | າ ກາ/         |               |
| ` '   | meter (F     | HLP). W/            | /m²K           |             |                   |   |  |             | _  | Sum(39) <sub>1</sub> (4) | 12 / 12-           | 00.7          | (00           |
| (39)m= 68.83<br>Heat loss para<br>(40)m= 0.87 | ameter (H    | HLP), W/            | /m²K<br>0.84   | 0.83        | 0.8               | 0.8   | 0.8  |             | = (39)m ÷  |                          | 0.85               | ]             | (00           |

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. Wa   | iter heat                       | ing ener       | gy requi              | rement:     |             |             |             |             |              |            |                                       | kWh/ye   | ear:    |       |
| if TF   | ed occu<br>A > 13.9<br>A £ 13.9 | 0, N = 1       |                       | [1 - exp    | (-0.0003    | 349 x (TF   | FA -13.9)   | )2)] + 0.0  | 0013 x (T    | ΓFA -13.   |                                       | 44       |         | (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) |                                 |                |                       |             |             |             |             |             |              |            |                                       | (43)     |         |       |
|   | Jan                             | Feb            | Mar                   | Apr         | May         | Jun         | Jul         | Aug         | Sep          | Oct        | Nov                                   | Dec      |         |       |
| Hot wate  |                                 |                | day for ea            | ach month   |             |             |             |             |              |            |                                       |          | ı       |       |
| (44)m=  | 101.32                          | 97.63          | 93.95                 | 90.26       | 86.58       | 82.89       | 82.89       | 86.58       | 90.26        | 93.95      | 97.63                                 | 101.32   |         | 7(44) |
| Energy o  | content of                      | hot water      | used - cal            | culated mo  | onthly = 4. | 190 x Vd,n  | n x nm x D  | OTm / 3600  |              |            | m(44) <sub>112</sub> =<br>ables 1b, 1 |          | 1105.27 | (44)  |
| (45)m=  | 150.25                          | 131.41         | 135.6                 | 118.22      | 113.44      | 97.89       | 90.71       | 104.09      | 105.33       | 122.75     | 133.99                                | 145.51   |         |       |
| If instant  | taneous w                       | ater heati     | ng at point           | of use (no  | hot water   | storage)    | enter () in | hoves (46   |              | Total = Su | m(45) <sub>112</sub> =                | -        | 1449.18 | (45)  |
| i   | · ·                             |                |                       | 17.73       |             |             |             |             | ` ′          | 10.44      | 20.4                                  | 21.83    | 1       | (46)  |
| (46)m=<br>Water   | 22.54<br>storage                | 19.71<br>loss: | 20.34                 | 17.73       | 17.02       | 14.68       | 13.61       | 15.61       | 15.8         | 18.41      | 20.1                                  | 21.03    |         | (40)  |
| Storag  | e volum                         | e (litres)     | includin              | ig any so   | olar or W   | /WHRS       | storage     | within sa   | ame ves      | sel        |                                       | 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:   |                                 |                |                       |             |             |             |             |             |              |            |                                       |          |         |       |
| ,   |                                 |                | eclared l             |             | or is kno   | wn (kWh     | n/day):     |             |              |            |                                       | 0        |         | (48)  |
| •   |                                 |                | m Table               |             |             |             |             | (40) (40)   |              |            |                                       | 0        |         | (49)  |
| 0,  |                                 |                | storage<br>eclared o  |             |             | or is not   |             | (48) x (49) | ) =          |            | 1                                     | 10       |         | (50)  |
| Hot wa  | iter stora                      | age loss       | factor fr             | om Tabl     |             |             |             |             |              |            | 0.                                    | 02       |         | (51)  |
|   | nunity h<br>e factor            | •              | ee section            | on 4.3      |             |             |             |             |              |            |                                       | 03       |         | (52)  |
|   |                                 |                | m Table               | 2b          |             |             |             |             |              |            |                                       | .6       |         | (52)  |
| Energy  | lost fro                        | m water        | storage               | , kWh/ye    | ear         |             |             | (47) x (51) | x (52) x (   | 53) =      | 1.                                    | 03       |         | (54)  |
| Enter   | (50) or (                       | 54) in (5      | 55)                   |             |             |             |             |             |              |            | 1.                                    | 03       |         | (55)  |
| Water   | storage                         | loss cal       | culated f             | or each     | month       |             |             | ((56)m = (  | 55) × (41)r  | m          |                                       |          |         |       |
| (56)m=  | 32.01                           | 28.92          | 32.01                 | 30.98       | 32.01       | 30.98       | 32.01       | 32.01       | 30.98        | 32.01      | 30.98                                 | 32.01    |         | (56)  |
| If cylinde  | er contains                     | dedicate       | d solar sto           | rage, (57)ı | m = (56)m   | x [(50) – ( | H11)] ÷ (5  | 0), else (5 | 7)m = (56)   | m where (  | H11) is fro                           | m Append | ix H    |       |
| (57)m=  | 32.01                           | 28.92          | 32.01                 | 30.98       | 32.01       | 30.98       | 32.01       | 32.01       | 30.98        | 32.01      | 30.98                                 | 32.01    |         | (57)  |
|   | •                               | •              | inual) fro            |             |             |             |             |             |              |            |                                       | 0        |         | (58)  |
|   | •                               |                | culated to<br>com Tab |             | •           |             | ,           | , ,         | m<br>cylinde | r thermo   | stat)                                 |          |         |       |
| (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 cal                        | culated        | for each              | month (     | 61)m =      | (60) ÷ 36   | 65 × (41)   | )m          |              |            |                                       |          | •       |       |
| (61)m=  | 0                               | 0              | 0                     | 0           | 0           | 0           | 0           | 0           | 0            | 0          | 0                                     | 0        |         | (61)  |

| Column   20.5.33   | Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$         | n    |  |  |  |  |  |  |  |  |  |  |
|--|---|------|--|--|--|--|--|--|--|--|--|--|
| Control   Cont | (62)m= 205.53 181.34 190.88 171.71 168.71 151.38 145.98 159.36 158.82 178.03 187.49 200.78  | (62) |  |  |  |  |  |  |  |  |  |  |
| Colimate   O   O   O   O   O   O   O   O   O   | Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) |      |  |  |  |  |  |  |  |  |  |  |
| Output from water heater  (64)m= 205.53  | (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)  |      |  |  |  |  |  |  |  |  |  |  |
| Column   C | (63)m= 0 0 0 0 0 0 0 0 0 0 0 0  | (63) |  |  |  |  |  |  |  |  |  |  |
| Culput from water heater   Cannual)  | Output from water heater  |      |  |  |  |  |  |  |  |  |  |  |
| Heat gains from water heating, kWh/morth 0.25 [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m   94.18   83.64   89.31   82.1   81.94   75.34   74.38   78.83   77.82   85.04   87.35   92.6   (65)m   10clude (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating    Sum (see Table 5), Watts  | (64)m= 205.53 181.34 190.88 171.71 168.71 151.38 145.98 159.36 158.82 178.03 187.49 200.78  | _    |  |  |  |  |  |  |  |  |  |  |
| 65 me   94.18   83.64   89.31   82.1   81.94   75.34   74.38   76.83   77.82   85.04   87.35   92.6   (65)     include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating    S. Internal gains (see Table 5 and 5a)  | Output from water heater (annual) 112   |      |  |  |  |  |  |  |  |  |  |  |
| 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   | Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + $(61)$ m] + 0.8 $\times [(46)$ m + $(57)$ m + $(59)$ m]      |      |  |  |  |  |  |  |  |  |  |  |
| Metabolic gains (rable 5), Watts   | (65)m= 94.18 83.64 89.31 82.1 81.94 75.34 74.38 78.83 77.82 85.04 87.35 92.6  | (65) |  |  |  |  |  |  |  |  |  |  |
| Metabolic gains (Table 5), Watts   | include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating                    |      |  |  |  |  |  |  |  |  |  |  |
| Solid   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   146.29   | 5. Internal gains (see Table 5 and 5a):   |      |  |  |  |  |  |  |  |  |  |  |
| Copy    | Metabolic gains (Table 5), Watts  |      |  |  |  |  |  |  |  |  |  |  |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5  (67)m=  | Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec   |      |  |  |  |  |  |  |  |  |  |  |
| CF)   March   S0.76  | (66)m= 146.29 146.29 146.29 146.29 146.29 146.29 146.29 146.29 146.29 146.29 146.29 146.29 146.29 146.29                            | (66) |  |  |  |  |  |  |  |  |  |  |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5  (68)m= 323.5 326.86 318.4 300.39 277.66 256.29 242.02 238.66 247.12 265.13 287.86 309.23 (68)  Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 [69]  Pumps and fans gains (Table 5a)  (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   | Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5   |      |  |  |  |  |  |  |  |  |  |  |
| (68)m= 323.5 326.86 318.4 300.39 277.66 256.29 242.02 238.66 247.12 265.13 287.86 309.23 (68)  Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 (69)  Pumps and fans gains (Table 5a)  (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  | (67)m= 50.76 45.09 36.67 27.76 20.75 17.52 18.93 24.61 33.03 41.93 48.94 52.18  | (67) |  |  |  |  |  |  |  |  |  |  |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m=   | Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5   |      |  |  |  |  |  |  |  |  |  |  |
| Figure   | (68)m= 323.5 326.86 318.4 300.39 277.66 256.29 242.02 238.66 247.12 265.13 287.86 309.23  | (68) |  |  |  |  |  |  |  |  |  |  |
| Pumps and fans gains (Table 5a)  (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  | Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  |      |  |  |  |  |  |  |  |  |  |  |
| Colored   Colo | (69)m= 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07 52.07  | (69) |  |  |  |  |  |  |  |  |  |  |
| Losses e.g. evaporation (negative values) (Table 5) (71)m=   | Pumps and fans gains (Table 5a)   |      |  |  |  |  |  |  |  |  |  |  |
| (71)me         97.53         108.08         114.3         121.32         124.47         (72)           Total internal gains:         (60.68)         \$97.23         \$461.75 <th< td=""><td>(70)m= 0 0 0 0 0 0 0 0 0 0 0</td><td>(70)</td></th<>  | (70)m= 0 0 0 0 0 0 0 0 0 0 0  | (70) |  |  |  |  |  |  |  |  |  |  |
| Water heating gains (Table 5)  (72)m=  | Losses e.g. evaporation (negative values) (Table 5)   |      |  |  |  |  |  |  |  |  |  |  |
| Total internal gains =   (66)m + (67)m + (68)m + (70)m + (71)m + (72)m   | (71)m= -97.53 -97.53 -97.53 -97.53 -97.53 -97.53 -97.53 -97.53 -97.53 -97.53 -97.53   | (71) |  |  |  |  |  |  |  |  |  |  |
| Total internal gains =   | Water heating gains (Table 5)   |      |  |  |  |  |  |  |  |  |  |  |
| (73)m= 601.68 597.23 575.93 543.01 509.37 479.28 461.75 470.05 489.05 522.19 558.95 586.7 (73)  6. Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.  Orientation: Access Factor Table 6d m² Table 6a Table 6b Table 6c (W)  South 0.9x 0.77 x 12.15 x 46.75 x 0.63 x 0.7 = 173.6 (78)  South 0.9x 0.77 x 12.15 x 76.57 x 0.63 x 0.7 = 284.31 (78)  South 0.9x 0.77 x 12.15 x 97.53 x 0.63 x 0.7 = 362.16 (78)  South 0.9x 0.77 x 12.15 x 110.23 x 0.63 x 0.7 = 409.32 (78)  South 0.9x 0.77 x 12.15 x 110.23 x 0.63 x 0.7 = 426.54 (78)  South 0.9x 0.77 x 12.15 x 114.87 x 0.63 x 0.7 = 426.54 (78)  South 0.9x 0.77 x 12.15 x 110.55 x 110.55 x 0.63 x 0.7 = 426.54 (78)  South 0.9x 0.77 x 12.15 x 110.55 x 0.63 x 0.7 = 426.54 (78)  | (72)m= 126.58 124.46 120.04 114.03 110.13 104.64 99.97 105.95 108.08 114.3 121.32 124.47  | (72) |  |  |  |  |  |  |  |  |  |  |
| 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       Table 6b       FF Table 6c       Gains (W)         South 0.9x 0.77  | Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$  |      |  |  |  |  |  |  |  |  |  |  |
| Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.  Orientation: Access Factor Table 6d  | (73)m= 601.68 597.23 575.93 543.01 509.37 479.28 461.75 470.05 489.05 522.19 558.95 586.7   | (73) |  |  |  |  |  |  |  |  |  |  |
| Orientation:         Access Factor Table 6d         Area m²         Flux Table 6a $g_{-}$ Table 6b         FF Table 6c         Gains (W)           South 0.9x 0.77         x 12.15         x 46.75         x 0.63         x 0.7         = 173.6 (78)           South 0.9x 0.77         x 12.15         x 76.57         x 0.63         x 0.7         = 284.31 (78)           South 0.9x 0.77         x 12.15         x 97.53         x 0.63         x 0.7         = 362.16 (78)           South 0.9x 0.77         x 12.15         x 110.23         x 0.63         x 0.7         = 409.32 (78)           South 0.9x 0.77         x 12.15         x 114.87         x 0.63         x 0.7         = 426.54 (78)           South 0.9x 0.77         x 12.15         x 110.55         x 0.63         x 0.7         = 410.49 (78)   | 6. Solar gains:   |      |  |  |  |  |  |  |  |  |  |  |
| Table 6d m <sup>2</sup> Table 6a Table 6b Table 6c (W)  South 0.9x 0.77 x 12.15 x 46.75 x 0.63 x 0.7 = 173.6 (78)  South 0.9x 0.77 x 12.15 x 76.57 x 0.63 x 0.7 = 284.31 (78)  South 0.9x 0.77 x 12.15 x 97.53 x 0.63 x 0.7 = 362.16 (78)  South 0.9x 0.77 x 12.15 x 110.23 x 0.63 x 0.7 = 409.32 (78)  South 0.9x 0.77 x 12.15 x 110.23 x 0.63 x 0.7 = 409.32 (78)  South 0.9x 0.77 x 12.15 x 114.87 x 0.63 x 0.7 = 426.54 (78)  South 0.9x 0.77 x 12.15 x 110.55 x 0.63 x 0.7 = 410.49 (78)  | Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.        |      |  |  |  |  |  |  |  |  |  |  |
| South       0.9x       0.77       x       12.15       x       46.75       x       0.63       x       0.7       =       173.6       (78)         South       0.9x       0.77       x       12.15       x       76.57       x       0.63       x       0.7       =       284.31       (78)         South       0.9x       0.77       x       12.15       x       97.53       x       0.63       x       0.7       =       362.16       (78)         South       0.9x       0.77       x       12.15       x       110.23       x       0.63       x       0.7       =       409.32       (78)         South       0.9x       0.77       x       12.15       x       114.87       x       0.63       x       0.7       =       426.54       (78)         South       0.9x       0.77       x       12.15       x       110.55       x       0.63       x       0.7       =       410.49       (78)  | <b>5</b> –  |      |  |  |  |  |  |  |  |  |  |  |
| South       0.9x       0.77       x       12.15       x       76.57       x       0.63       x       0.7       =       284.31       (78)         South       0.9x       0.77       x       12.15       x       97.53       x       0.63       x       0.7       =       362.16       (78)         South       0.9x       0.77       x       12.15       x       110.23       x       0.63       x       0.7       =       409.32       (78)         South       0.9x       0.77       x       12.15       x       114.87       x       0.63       x       0.7       =       426.54       (78)         South       0.9x       0.77       x       12.15       x       110.55       x       0.63       x       0.7       =       410.49       (78)  | Table 6d m² Table 6a Table 6b Table 6c (W)  |      |  |  |  |  |  |  |  |  |  |  |
| South       0.9x       0.77       x       12.15       x       97.53       x       0.63       x       0.7       =       362.16       (78)         South       0.9x       0.77       x       12.15       x       110.23       x       0.63       x       0.7       =       409.32       (78)         South       0.9x       0.77       x       12.15       x       114.87       x       0.63       x       0.7       =       426.54       (78)         South       0.9x       0.77       x       12.15       x       110.55       x       0.63       x       0.7       =       410.49       (78)   | South 0.9x 0.77 x 12.15 x 46.75 x 0.63 x 0.7 = 173.6  | (78) |  |  |  |  |  |  |  |  |  |  |
| South     0.9x     0.77     x     12.15     x     110.23     x     0.63     x     0.7     =     409.32     (78)       South     0.9x     0.77     x     12.15     x     114.87     x     0.63     x     0.7     =     426.54     (78)       South     0.9x     0.77     x     12.15     x     110.55     x     0.63     x     0.7     =     410.49     (78)  | South 0.9x 0.77 x 12.15 x 76.57 x 0.63 x 0.7 = 284.31   | (78) |  |  |  |  |  |  |  |  |  |  |
| South 0.9x 0.77 x 12.15 x 114.87 x 0.63 x 0.7 = 426.54 (78) South 0.9x 0.77 x 12.15 x 110.55 x 0.63 x 0.7 = 410.49 (78)  | South 0.9x 0.77 x 12.15 x 97.53 x 0.63 x 0.7 = 362.16   | (78) |  |  |  |  |  |  |  |  |  |  |
| South 0.9x 0.77 x 12.15 x 110.55 x 0.63 x 0.7 = 410.49 (78)  | South 0.9x 0.77 x 12.15 x 110.23 x 0.63 x 0.7 = 409.32  | (78) |  |  |  |  |  |  |  |  |  |  |
|  | South 0.9x 0.77 x 12.15 x 114.87 x 0.63 x 0.7 = 426.54  | (78) |  |  |  |  |  |  |  |  |  |  |
| South 0.9x 0.77 x 12.15 x 108.01 x 0.63 x 0.77 = 401.07 (78)   | South 0.9x 0.77 x 12.15 x 110.55 x 0.63 x 0.7 = 410.49  | (78) |  |  |  |  |  |  |  |  |  |  |
|  | South 0.9x 0.77 x 12.15 x 108.01 x 0.63 x 0.7 = 401.07  | (78) |  |  |  |  |  |  |  |  |  |  |
| South 0.9x 0.77 x 12.15 x 104.89 x 0.63 x 0.7 = 389.49 (78)  | South 0.9x 0.77 x 12.15 x 104.89 x 0.63 x 0.7 = 389.49  | (78) |  |  |  |  |  |  |  |  |  |  |

| South                                   | 0.9x      | 0.77        | X                | 12.       | 15        | x            | 10     | 01.89  | x               |                | 0.63       | x         | 0.7         | =                              | 378.32  | (78)         |
|---|-----------|-------------|------------------|-----------|-----------|--------------|--------|--|-----------------|----------------|------------|-----------|-------------|--------------------------------|---------|--------------|
| South                                   | 0.9x      | 0.77        | X                | 12.       | 15        | x            | 8      | 2.59   | x               |                | 0.63       | x [       | 0.7         | =                              | 306.66  | (78)         |
| South                                   | 0.9x      | 0.77        | x                | 12.       | 15        | x            | 5      | 5.42   | x               |                | 0.63       | х [       | 0.7         | =                              | 205.77  | (78)         |
| South                                   | 0.9x      | 0.77        | x                | 12.       | 15        | x            | 4      | 40.4   | x               |                | 0.63       | x         | 0.7         | _ =                            | 150.01  | (78)         |
|   | _         |             |                  |           |           | Ī            |        |  |                 |                |            |           |             |                                |         | _            |
| Solar                                   | gains in  | watts, ca   | alculated        | for eacl  | h month   |              |        |  | (83)m :         | = Sı           | um(74)m .  | (82)m     |             |                                |         |              |
| (83)m=                                  | 173.6     | 284.31      | 362.16           | 409.32    | 426.54    | 41           | 0.49   | 401.07   | 389.4           | 49             | 378.32     | 306.66    | 205.77      | 150.01                         | 7       | (83)         |
| Total g                                 | ains – ii | nternal a   | nd solar         | (84)m =   | = (73)m · | + (8         | 33)m   | , watts  | •               |                |            |           | •           | •                              | _       |              |
| (84)m=                                  | 775.28    | 881.54      | 938.1            | 952.33    | 935.91    | 88           | 39.77  | 862.82   | 859.5           | 54             | 867.37     | 828.84    | 764.72      | 736.7                          | 7       | (84)         |
| 7. Me                                   | an inter  | nal temp    | erature          | (heating  | season    | )            |        |  |                 |                |            |           |             |                                |         |              |
|   |           |             | eating p         | `         |           | ,            | area f | from Tab   | ole 9,          | Th1            | 1 (°C)     |           |             |                                | 21      | (85)         |
| •                                       |           | J           | ains for I       |           |           | •            |        |  | ,               |                | ( )        |           |             |                                |         | `            |
| • | Jan       | Feb         | Mar              | Apr       | May       | È            | Jun    | Jul  | Au              | a              | Sep        | Oct       | Nov         | Dec                            | 7       |              |
| (86)m=                                  | 0.88      | 0.83        | 0.78             | 0.69      | 0.58      | ┢━           | ).44   | 0.32   | 0.33            | <del>-  </del> | 0.48       | 0.68      | 0.83        | 0.89                           | 1       | (86)         |
|   | · ,       |             |                  |           | T4 //     | <u></u>      |        |  |                 |                |            |           |             | <u> </u>                       | _       |              |
|   |           |             | ature in I       |           |           | _            |        | <del>i                                      </del> |                 |                |            | 00.74     | 1 00 07     | 1004                           | ٦       | (07)         |
| (87)m=                                  | 19.83     | 20.08       | 20.35            | 20.65     | 20.84     | 20           | 0.96   | 20.99  | 20.9            | 9              | 20.94      | 20.71     | 20.27       | 19.81                          | J       | (87)         |
| Temp                                    | erature   | during h    | eating p         | eriods ir | rest of   | dw           | elling | from Ta  | ble 9           | , Th           | n2 (°C)    |           |             |                                | _       |              |
| (88)m=                                  | 20.19     | 20.19       | 20.2             | 20.22     | 20.23     | 20           | 0.25   | 20.25  | 20.2            | 6              | 20.24      | 20.23     | 20.22       | 20.21                          |         | (88)         |
| Utilisa                                 | ation fac | tor for g   | ains for r       | est of d  | welling,  | h2,ı         | m (se  | e Table  | 9a)             |                |            |           |             |                                |         |              |
| (89)m=                                  | 0.87      | 0.82        | 0.76             | 0.66      | 0.54      |              | 0.39   | 0.26   | 0.28            | 3              | 0.43       | 0.65      | 0.81        | 0.88                           | 7       | (89)         |
| Mean                                    | interna   | l temper    | ature in t       | the rest  | of dwelli | na '         | T2 (f  | ollow ste  | ns 3 1          | —-<br>to 7     | ' in Tahl  | e 9c)     | •           |                                | _       |              |
| (90)m=                                  | 18.64     | 19          | 19.38            | 19.8      | 20.05     | Ť            | 0.21   | 20.24  | 20.2            |                | 20.18      | 19.89     | 19.28       | 18.63                          | 7       | (90)         |
| , ,                                     |           |             | l l              |           |           |              |        |  | <u> </u>        | !              | f          | LA = Liv  | ng area ÷ ( | 4) =                           | 0.47    | (91)         |
|   |           |             | . "              |           |           |              | ٠ ،    |  | /4              |                | A) TO      |           |             |                                |         | <b>」</b> ` ′ |
|   |           | <del></del> | ature (fo        |           |           | <del>`</del> |        | i  | <del>- `-</del> | _              |            | 20.07     | 10.74       | 1040                           | ٦       | (92)         |
| (92)m=                                  | 19.2      | 19.51       | 19.84            | 20.19     | 20.42     |              | 0.56   | 20.59  | 20.5            |                | 20.53      | 20.27     | 19.74       | 19.18                          | J       | (92)         |
| (93)m=                                  | 19.2      | 19.51       | ne mean<br>19.84 | 20.19     | 20.42     | 1            | 0.56   | m Table  | 20.5            |                | 20.53      | 20.27     | 19.74       | 19.18                          | ٦       | (93)         |
|   |           |             |                  | 20.19     | 20.42     | 20           | 0.56   | 20.59  | 20.5            | 9              | 20.53      | 20.27     | 19.74       | 19.16                          |         | (93)         |
|   |           | ·           | uirement         | nnoratuu  | ro obtoir | ر<br>ام      | at eta | on 11 of   | Table           | . Ωh           | oo tha     | t Ti m-   | (76)m an    | d ro col                       | culato  |              |
|   |           |             | or gains u       |           |           | leu          | ai Sit | <del>з</del> р 11 01                               | Table           | ; 9D           | ), 50 illa | t 11,111= | (70)III ali | u i <del>e-</del> cai          | Culate  |              |
|   | Jan       | Feb         | Mar              | Apr       | May       | Γ            | Jun    | Jul  | Au              | g              | Sep        | Oct       | Nov         | Dec                            | 7       |              |
| Utilisa                                 | ation fac | tor for g   | ains, hm         | •         | ,         | <u> </u>     |        |  |                 | <u> </u>       | •          |           |             |                                | _       |              |
| (94)m=                                  | 0.85      | 0.8         | 0.75             | 0.66      | 0.55      | 0            | ).41   | 0.29   | 0.3             |                | 0.45       | 0.65      | 0.8         | 0.86                           | 7       | (94)         |
| Usefu                                   | ıl gains, | hmGm .      | W = (94)         | l)m x (84 | 4)m       |              |        |  |                 |                |            |           | <u>.</u> !  |                                | _       |              |
| (95)m=                                  | 659.66    | 707.93      | 699.37           | 629.8     | 518.79    | 36           | 3.74   | 249.25   | 259.6           | 61             | 392.45     | 540.59    | 608.24      | 635.68                         | 7       | (95)         |
| Month                                   | nly avera | age exte    | rnal tem         | perature  | from Ta   | able         | e 8    | •  | •               | •              |            |           | •           | •                              | -       |              |
| (96)m=                                  | 4.3       | 4.9         | 6.5              | 8.9       | 11.7      | 1            | 4.6    | 16.6   | 16.4            | 1              | 14.1       | 10.6      | 7.1         | 4.2                            | 7       | (96)         |
| Heat                                    | loss rate | e for mea   | an intern        | al tempe  | erature,  | Lm           | , W =  | =[(39)m :  | x [(93          | )m-            | - (96)m    | ]         |             |                                | -<br>-  |              |
| (97)m=                                  | 1025.52   | 998.96      | 906.35           | 743.24    | 569.98    | 37           | 6.74   | 252.33   | 263.2           | 22             | 412.19     | 632.38    | 837.54      | 1005.34                        | · I     | (97)         |
| Space                                   | e heatin  | g require   | ement fo         | r each n  | nonth, k  | /Vh/         | /mont  | th = 0.02  | 24 x [(         | 97)            | m – (95    | )m] x (4  | 11)m        |                                |         |              |
| (98)m=                                  | 272.2     | 195.57      | 153.99           | 81.67     | 38.09     |              | 0      | 0  | 0               |                | 0          | 68.29     | 165.09      | 275.03                         |         |              |
|   |           |             |                  |           |           |              |        |  | Т               | otal           | per year   | (kWh/ye   | ar) = Sum(9 | <b>18)</b> <sub>15,912</sub> = | 1249.93 | (98)         |
| Space                                   | e heatin  | g require   | ement in         | kWh/m²    | /year     |              |        |  |                 |                |            |           |             |                                | 15.88   | (99)         |
|   |           |             |                  |           |           |              |        |  |                 |                |            |           |             |                                |         |              |

| 9b. Energy requirements – Community heating scheme   |                                       |                     |             |
|--|---------------------------------------|---------------------|-------------|
| This part is used for space heating, space cooling or water heating pr<br>Fraction of space heat from secondary/supplementary heating (Table |                                       | 0                   | (301)       |
| Fraction of space heat from community system $1 - (301) =$   |                                       | 1                   | (302)       |
| The community scheme may obtain heat from several sources. The procedure allows  |                                       | ne latter           | _           |
| includes boilers, heat pumps, geothermal and waste heat from power stations. See Ap<br>Fraction of heat from Community boilers               | pendix C.                             | 0.4                 | (303a)      |
| Fraction of community heat from heat source 2  | [                                     | 0.4                 | (303b)      |
| Fraction of total space heat from Community boilers  | (302) x (303a) =                      | 0.4                 | (304a)      |
| Fraction of total space heat from community heat source 2  | (302) x (303b) =                      | 0.4                 | (304b)      |
| Factor for control and charging method (Table 4c(3)) for community h   | eating system                         | 1                   | (305)       |
| Distribution loss factor (Table 12c) for community heating system  | ]                                     | 1.05                | (306)       |
| Space heating  | -                                     | kWh/year            | _           |
| Annual space heating requirement   |                                       | 1249.93             | ╛           |
| Space heat from Community boilers  | (98) x (304a) x (305) x (306) =       | 524.97              | (307a)      |
| Space heat from heat source 2  | (98) x (304b) x (305) x (306) =       | 524.97              | (307b)      |
| Efficiency of secondary/supplementary heating system in % (from Tal  | ble 4a or Appendix E)                 | 0                   | (308        |
| Space heating requirement from secondary/supplementary system  | (98) x (301) x 100 ÷ (308) =          | 0                   | (309)       |
| Water heating Annual water heating requirement   | [                                     | 2100.02             | 7           |
| If DHW from community scheme: Water heat from Community boilers  | (64) x (303a) x (305) x (306) =       | 882.01              | ☐<br>(310a) |
| Water heat from heat source 2  | (64) x (303b) x (305) x (306) =       | 882.01              | (310b)      |
|  | .01 × [(307a)(307e) + (310a)(310e)] = | 28.14               | (313)       |
| Cooling System Energy Efficiency Ratio   |                                       | 0                   | 」(314)      |
| Space cooling (if there is a fixed cooling system, if not enter 0)   | = (107) ÷ (314) =                     | 0                   | (315)       |
| Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside         | de [                                  | 287.39              | ](330a)     |
| warm air heating system fans   | [                                     | 0                   | (330b)      |
| pump for solar water heating   | [                                     | 0                   | (330g)      |
| Total electricity for the above, kWh/year  | =(330a) + (330b) + (330g) =           | 287.39              | (331)       |
| Energy for lighting (calculated in Appendix L)   | [                                     | 358.61              | (332)       |
| Electricity generated by PVs (Appendix M) (negative quantity)  | [                                     | -768.62             | (333)       |
| Electricity generated by wind turbine (Appendix M) (negative quantity  | )<br>[                                | 0                   | (334)       |
| 10b. Fuel costs – Community heating scheme   |                                       |                     |             |
| <b>Fuel</b><br>kWh/year  | Fuel Price<br>(Table 12)              | Fuel Cost<br>£/year |             |

(307a) x

Space heating from CHP

22.26

(340a)

x 0.01 =

| Space heating from heat source 2           | (307b) x                                   | 4.24 x 0.0°                       | 1 = 22.26 (340b)            |
|--|--|-----------------------------------|-----------------------------|
| Water heating from CHP                     | (310a) x                                   | 4.24 × 0.0°                       | 1 = 37.4 (342a)             |
| Water heating from heat source 2           | (310b) x                                   | 4.24 × 0.0°                       | 1 = 37.4 (342b)             |
|  |  | Fuel Price                        |                             |
| Pumps and fans                             | (331)                                      | 13.19 x 0.0                       | 1 = 37.91 (349)             |
| Energy for lighting                        | (332)                                      | 13.19 x 0.0°                      | 1 = 47.3 (350)              |
| Additional standing charges (Table 12)     |  |                                   | 120 (351)                   |
| Energy saving/generation technologies      |  |                                   |                             |
| Total energy cost                          | = (340a)(342e) + (345)(354) =              |                                   | 324.52 (355)                |
| 11b. SAP rating - Community heating        | scheme                                     |                                   |                             |
| Energy cost deflator (Table 12)            |  |                                   | 0.42 (356)                  |
| Energy cost factor (ECF)                   | $[(355) \times (356)] \div [(4) + 45.0] =$ |                                   | 1.1 (357)                   |
| SAP rating (section12)                     |  |                                   | 84.63 (358)                 |
| 12b. CO2 Emissions – Community hear        |  |                                   |                             |
|  | Energy<br>kWh/ye                           |                                   | or Emissions<br>kg CO2/year |
| CO2 from other sources of space and v      | vater heating (not CHP)                    | •                                 |                             |
| Efficiency of heat source 1 (%)            | If there is CHP using two fuels repe       | eat (363) to (366) for the second | d fuel 89 (367a)            |
| Efficiency of heat source 2 (%)            | If there is CHP using two fuels repe       | eat (363) to (366) for the second | d fuel 89 (367b)            |
| CO2 associated with heat source 1          | [(307b)+(310b)] x 100 ÷                    | - (367b) x 0.22                   | = 341.47 (367)              |
| CO2 associated with heat source 2          | [(307b)+(310b)] x 100 ÷                    | - (367b) x 0.22                   | = 341.47 (368)              |
| Electrical energy for heat distribution    | [(313) x                                   | 0.52                              | = 14.6 (372)                |
| Total CO2 associated with community s      | systems (363)(366) +                       | (368)(372)                        | = 697.54 (373)              |
| CO2 associated with space heating (se      | econdary) (309) x                          | 0                                 | = 0 (374)                   |
| CO2 associated with water from immers      | sion heater or instantaneous heater        | (312) x 0.22                      | = 0 (375)                   |
| Total CO2 associated with space and w      | vater heating (373) + (374) +              | · (375) =                         | 697.54 (376)                |
| CO2 associated with electricity for pum    | ps and fans within dwelling (331)) x       | 0.52                              | = 149.16 (378)              |
| CO2 associated with electricity for lighti | ing (332))) x                              | 0.52                              | = 186.12 (379)              |
| Energy saving/generation technologies      | (333) to (334) as applicable               |                                   |                             |
| Item 1                                     | (10-0)                                     | 0.52 x 0.0°                       | -390.91                     |
| Total CO2, kg/year                         | sum of (376)(382) =                        |                                   | 633.9 (383)                 |
| Dwelling CO2 Emission Rate                 | (383) ÷ (4) =                              |                                   | 8.05 (384)                  |
| El rating (section 14)                     |  |                                   | 93.13 (385)                 |
| 13b. Primary Energy – Community hear       | ting scheme<br>Energy                      | Primary                           | P.Energy                    |
|  | kWh/ye                                     |                                   | kWh/year                    |
| Energy from other sources of space and     |  |                                   |                             |
| Efficiency of heat source 1 (%)            | If there is CHP using two fuels repe       | eat (363) to (366) for the second | d fuel 89 (367a)            |

| Efficiency of heat source 2 (%)                 | If there is CHP using two fuels repeat (363) to (3 | 366) for the second fuel | 89       | (367b) |
|---|--|--------------------------|----------|--------|
| Energy associated with heat source 1            | [(307b)+(310b)] x 100 ÷ (367b) x                   | 1.22 =                   | 1928.67  | (367)  |
| Energy associated with heat source 2            | [(307b)+(310b)] x 100 ÷ (367b) x                   | 1.22 =                   | 1928.67  | (368)  |
| Electrical energy for heat distribution         | [(313) x   | =                        | 86.39    | (372)  |
| Total Energy associated with community syste    | ems (363)(366) + (368)(372)                        | =                        | 3943.72  | (373)  |
| if it is negative set (373) to zero (unless spe | cified otherwise, see C7 in Appendix C)            |                          | 3943.72  | (373)  |
| Energy associated with space heating (second    | dary) (309) x                                      | 0 =                      | 0        | (374)  |
| Energy associated with water from immersion     | heater or instantaneous heater(312) x              | 1.22 =                   | 0        | (375)  |
| Total Energy associated with space and water    | r heating (373) + (374) + (375) =                  |                          | 3943.72  | (376)  |
| Energy associated with space cooling            | (315) x  | 3.07                     | 0        | (377)  |
| Energy associated with electricity for pumps a  | nd fans within dwelling (331)) x                   | 3.07                     | 882.3    | (378)  |
| Energy associated with electricity for lighting | (332))) x  | 3.07                     | 1100.92  | (379)  |
| Energy saving/generation technologies Item 1    |  | 3.07 x 0.01 =            | -2359.67 | (380)  |
| Total Primary Energy, kWh/year                  | sum of (376)(382) =                                |                          | 3567.27  | (383)  |

|  |  | User D        | etails:     |                     |            |          |           |               |              |
|--|--|---------------|-------------|---------------------|------------|----------|-----------|---------------|--------------|
| Assessor Name:   | John Ashe  | Strom         | a Num       | her:                |            | STRO     | 031268    |               |              |
| Software Name:   |  |               |             |                     |            |          |           |               |              |
|  |  | Property i    | Address     | : Unit 7 -          | COPPE      | ETTS W   | OOD, Lo   | ndon          |              |
| Address :  |  |               |             |                     |            |          |           |               |              |
| 1. Overall dwelling dime                                   | ensions:   |               |             |                     |            |          |           |               |              |
| Ground floor   |  |               | a(m²)       | (1a) v              |            | ight(m)  | 7(20)     | Volume(m³     | <u>-</u>     |
|  |  |               | 8.72        | (1a) x              | 2          | .66      | (2a) =    | 209.4         | (3a)         |
| Total floor area TFA = (1                                  | a)+(1b)+(1c)+(1d)+(1e)+(1                                    | n)            | 8.72        | (4)                 |            |          |           |               |              |
| Dwelling volume  |  |               |             | (3a)+(3b            | )+(3c)+(3c | d)+(3e)+ | (3n) =    | 209.4         | (5)          |
| 2. Ventilation rate:                                       |  |               |             |                     |            |          |           |               |              |
|  | main seconda<br>heating heating                              | iry<br>       | other       | _                   | total      |          |           | m³ per hou    | r<br>        |
| 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 fa                                  | ns   |               |             | Γ                   | 3          | X        | 10 =      | 30            | (7a)         |
| Number of passive vents                                    | <b>.</b>   |               |             | Ī                   | 0          | x -      | 10 =      | 0             | (7b)         |
| Number of flueless gas fi                                  | res  |               |             | Ē                   | 0          | x        | 40 =      | 0             | (7c)         |
|  |  |               |             | _                   |            |          |           |               |              |
|  |  |               |             |                     |            |          | Air ch    | nanges per ho | our          |
| ·  | ys, flues and fans = $(6a)+(6b)+$                            |               |             |                     | 30         |          | ÷ (5) =   | 0.14          | (8)          |
| If a pressurisation test has b<br>Number of storeys in the | peen carried out or is intended, proce                       | ed to (17), o | otherwise ( | continue fr         | om (9) to  | (16)     |           |               | <b>—</b> (0) |
| Additional infiltration                                    | ne aweiling (115)  |               |             |                     |            | [(9)]    | -1]x0.1 = | 0             | (9)<br>(10)  |
|  | .25 for steel or timber frame of                             | or 0.35 for   | r masoni    | y constr            | uction     | 1(0)     |           | 0             | (11)         |
| •••  | resent, use the value corresponding                          | to the great  | er wall are | a (after            |            |          |           |               |              |
| deducting areas of openii                                  | ngs); if equal user 0.35<br>floor, enter 0.2 (unsealed) or ( | ) 1 (seale    | ad) else    | enter ()            |            |          |           | 0             | (12)         |
| If no draught lobby, en                                    | ,  | 7.1 (Joure    | , cioc      | citici o            |            |          |           | 0             | (13)         |
| • ,  | s and doors draught stripped                                 |               |             |                     |            |          |           | 0             | (14)         |
| Window infiltration  |  |               | 0.25 - [0.2 | x (14) ÷ 1          | 00] =      |          |           | 0             | (15)         |
| Infiltration rate  |  |               | (8) + (10)  | + (11) + (1         | 12) + (13) | + (15) = |           | 0             | (16)         |
| • • •  | q50, expressed in cubic metr                                 | •             | •           | •                   | etre of e  | envelope | area      | 5             | (17)         |
| •  | ity value, then $(18) = [(17) \div 20] +$                    |               |             |                     |            |          |           | 0.39          | (18)         |
| Air permeability value applie  Number of sides sheltere    | es if a pressurisation test has been do                      | one or a deg  | gree air pe | rmeability          | is being u | sed      |           |               | (19)         |
| Shelter factor   | <del>cu</del>  |               | (20) = 1 -  | [0.0 <b>75</b> x (1 | 19)] =     |          |           | 0             | -(20)        |
| Infiltration rate incorporat                               | ting shelter factor  |               | (21) = (18  | ) x (20) =          |            |          |           | 0.39          | (21)         |
| Infiltration rate modified f                               | or monthly wind speed  |               |             |                     |            |          |           |               |              |
| Jan Feb  | Mar Apr May Jun  | Jul           | Aug         | Sep                 | Oct        | Nov      | Dec       |               |              |
| Monthly average wind sp                                    | eed 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 = (2                                    | 2)m <i>÷ 4</i>   |               |             |                     |            |          |           |               |              |
|  | 1.23 1.1 1.08 0.95   | 0.95          | 0.92        | 1                   | 1.08       | 1.12     | 1.18      | ]             |              |
| , ,,   | 1 1 1 1 1 1 1 1 1 1  | 1             |             | •                   |            |          |           | J             |              |

| Adjusted infiltr   | ation rat     | e (allowi   | ng for sh  | nelter an   | d wind s    | speed) =        | (21a) x                | (22a)m      |                        |             |           |                       |      |
|--|---------------|-------------|------------|-------------|-------------|-----------------|------------------------|-------------|------------------------|-------------|-----------|-----------------------|------|
| 0.5  | 0.49          | 0.48        | 0.43       | 0.42        | 0.37        | 0.37            | 0.36                   | 0.39        | 0.42                   | 0.44        | 0.46      |                       |      |
| Calculate effec  |               | _           | rate for t | he appli    | cable ca    | se              | •                      |             |                        |             |           |                       |      |
| If mechanicate of the street o |               |             | andiv N (2 | 3h) - (23s  | a) v Emy (e | aguation (I     | N5N othe               | nvice (23h  | n) = (23a)             |             |           | 0                     | (23  |
| If balanced with   |               | 0           |            | , ,         | ,           | . `             | ,, .                   | ,           | ) = (23a)              |             |           | 0                     | (23  |
| a) If balance  |               | •           | •          | ŭ           |             | `               |                        | •           | 2h\m + /               | 22h) [      | 1 (220)   | 0 . 1001              | (23  |
| (24a)m= 0  | 0             |             | 0          | 0           | 0           | 0               | 0                      | 0           | 0                      | 0           | 0         | <del>-</del> 100]<br> | (24  |
| b) If balance  |               | <u> </u>    |            |             |             |                 |                        |             |                        |             |           | J                     | •    |
| 24b)m= 0   | 0             | 0           | 0          | 0           | 0           | 0               | 0                      | 0           | 0                      | 0           | 0         | ]                     | (24  |
| c) If whole h  | ı<br>ıouse ex | tract ver   | tilation o | r positiv   | re input v  | ı<br>ventilatio | on from o              | utside      |                        |             | Į         | ı                     |      |
| if (22b)n  | n < 0.5 ×     | (23b), t    | hen (24d   | c) = (23b   | o); other   | wise (24        | c) = (22k              | o) m + 0    | .5 × (23b              | )           |           |                       |      |
| 24c)m= 0   | 0             | 0           | 0          | 0           | 0           | 0               | 0                      | 0           | 0                      | 0           | 0         |                       | (24  |
| d) If natural<br>if (22b)n   |               |             |            |             |             |                 | on from I<br>0.5 + [(2 |             | 0.5]                   |             |           |                       |      |
| (24d)m= 0.63   | 0.62          | 0.62        | 0.59       | 0.59        | 0.57        | 0.57            | 0.57                   | 0.58        | 0.59                   | 0.6         | 0.61      |                       | (24  |
| Effective air  | change        | rate - er   | nter (24a  | ) or (24k   | o) or (24   | c) or (24       | d) in box              | (25)        | -                      |             |           | •                     |      |
| (25)m= 0.63  | 0.62          | 0.62        | 0.59       | 0.59        | 0.57        | 0.57            | 0.57                   | 0.58        | 0.59                   | 0.6         | 0.61      |                       | (25  |
| 3. Heat losse  | s and he      | at loss r   | naramete   | ⊃r·         |             |                 |                        |             |                        |             |           |                       |      |
| ELEMENT  | Gros          | •           | Openin     |             | Net Ar      | ea              | U-valı                 | IE.         | AXU                    |             | k-value   | a .                   | ΑΧk  |
|  | area          |             | m          |             | A ,r        |                 | W/m2                   |             | (W/I                   | <)          | kJ/m²-l   |                       | kJ/K |
| Vindows  |               |             |            |             | 12.15       | <sub>5</sub> x1 | /[1/( 1.4 )+           | 0.04] =     | 16.11                  |             |           |                       | (2   |
| Floor  |               |             |            |             | 78.72       | <u>x</u>        | 0.13                   | <b>-</b>    | 10.2336                | 5 [         |           |                       | (28  |
| Nalls  | 27.3          | 34          | 12.1       | 5           | 15.19       | ) x             | 0.18                   | =           | 2.73                   |             |           | $\neg  \Box$          | (29  |
| Total area of e  | elements      | , m²        |            |             | 106.0       | 6               |                        |             |                        |             |           |                       | (3:  |
| for windows and  |               |             |            |             |             | ated using      | g formula 1            | /[(1/U-valu | ue)+0.04] a            | s given in  | paragraph | n 3.2                 |      |
| ** include the area  |               |             |            | ls and par  | titions     |                 | (26)(30)               | (22)        |                        |             |           |                       |      |
| Fabric heat los  |               | •           | U)         |             |             |                 | (20)(30)               |             | (20) : (20             | a) . (20-)  | (20-)     | 29.08                 | (3:  |
| Heat capacity  |               | ,           | . Cm .     | T [         | . l. 1/m21/ |                 |                        | ,           | (30) + (32             |             | (32e) =   | 9570.6                | (34  |
| Γhermal mass<br><sup>-</sup> or design assess  | •             | •           |            | ,           |             |                 | racisaly the           |             | tive Value:            |             | ahla 1f   | 250                   | (3   |
| can be used inste  |               |             |            | CONSTRUCT   | ion are no  | . Kilowii pi    | colscry the            | maioative   | , values of            | 11011 111 1 | abic 11   |                       |      |
| Thermal bridge   | es : S (L     | x Y) cal    | culated ı  | using Ap    | pendix l    | <               |                        |             |                        |             |           | 5.3                   | (3   |
| f details of therma  |               | are not kn  | own (36) = | = 0.05 x (3 | 1)          |                 |                        |             |                        |             |           |                       |      |
| Total fabric he  |               |             |            |             |             |                 |                        |             | (36) =                 |             |           | 34.38                 | (3   |
| /entilation hea  | ·             |             | l monthly  |             |             | <u> </u>        | 1                      |             | = 0.33 × (             | 25)m x (5   | 1         | 1                     |      |
| Jan  | Feb           | Mar         | Apr        | May         | Jun         | Jul             | Aug                    | Sep         | Oct                    | Nov         | Dec       |                       | (0)  |
| 38)m= 43.24  | 42.9          | 42.57       | 41.02      | 40.73       | 39.37       | 39.37           | 39.12                  | 39.89       | 40.73                  | 41.31       | 41.93     |                       | (3   |
| Heat transfer of   |               | ·           |            |             |             |                 |                        | (39)m       | = (37) + (3            |             |           | 1                     |      |
| 39)m= 77.62  | 77.28         | 76.95       | 75.39      | 75.1        | 73.75       | 73.75           | 73.5                   | 74.27       | 75.1                   | 75.69       | 76.31     |                       |      |
| Jost loce para   | meter (l      | HLP) W      | m²K        |             |             |                 |                        |             | Average =<br>= (39)m ÷ |             | 12 /12=   | 75.39                 | (3   |
| ייאט פפטו ומטו   |               | ·-· /, * */ |            |             |             | _               |                        | ( .0)       | (30)                   | V 77        |           | _                     |      |
| Heat loss para   | 0.98          | 0.98        | 0.96       | 0.95        | 0.94        | 0.94            | 0.93                   | 0.94        | 0.95                   | 0.96        | 0.97      |                       |      |

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. Wat                                  | ter heat              | ing ener        | gy requi                          | rement:     |                |            |            |                        |                       |             |                                       | kWh/ye   | ear:    |              |
| if TF                                   |                       |                 |                                   | [1 - exp    | (-0.0003       | 349 x (TF  | FA -13.9   | )2)] + 0.0             | 0013 x ( <sup>-</sup> | ΓFA -13.    | 2.<br>9)                              | 44       |         | (42)         |
| Reduce t                                | the annua             | ıl average      |                                   | usage by    | 5% if the a    | welling is | designed t | (25 x N)<br>to achieve |                       | se target o |                                       | .11      |         | (43)         |
|   | Jan                   | Feb             | Mar                               | Apr         | May            | Jun        | Jul        | Aug                    | Sep                   | Oct         | Nov                                   | Dec      |         |              |
| г                                       |                       |                 | day for ea                        |             |                |            |            |                        |                       |             |                                       |          | l       |              |
| (44)m=                                  | 101.32                | 97.63           | 93.95                             | 90.26       | 86.58          | 82.89      | 82.89      | 86.58                  | 90.26                 | 93.95       | 97.63                                 | 101.32   |         |              |
| Energy c                                | content of            | hot water       | used - cal                        | culated mo  | onthly $= 4$ . | 190 x Vd,r | n x nm x C | OTm / 3600             |                       |             | m(44) <sub>112</sub> =<br>ables 1b, 1 |          | 1105.27 | (44)         |
| (45)m=                                  | 150.25                | 131.41          | 135.6                             | 118.22      | 113.44         | 97.89      | 90.71      | 104.09                 | 105.33                | 122.75      | 133.99                                | 145.51   |         |              |
| If instanta                             | aneous w              | ater heatii     | na at point                       | of use (no  | hot water      | storage).  | enter 0 in | boxes (46              |                       | Γotal = Su  | m(45) <sub>112</sub> =                |          | 1449.18 | (45)         |
| (46)m=                                  | 0                     | 0               | 0                                 | 0           | 0              | 0          | 0          | 0                      | 0                     | 0           | 0                                     | 0        |         | (46)         |
| ` '                                     | storage               | -               | ,                                 | Ů           |                |            |            |                        | ,                     | · ·         | Ů                                     | Ů        |         | , ,          |
| Storage                                 | e volum               | e (litres)      | includin                          | g any so    | olar or W      | /WHRS      | storage    | within sa              | ame ves               | sel         |                                       | 150      |         | (47)         |
| Otherw<br>Water s                       | vise if no<br>storage | stored<br>loss: | nd no ta<br>hot wate<br>eclared l | er (this in | icludes i      | nstantar   | neous co   | (47)<br>mbi boil       | ers) ente             | er 'O' in ( |                                       |          | ſ       | (40)         |
| •                                       |                       |                 | m Table                           |             | טווא פו וכ     | wii (Kvvi  | i/uay).    |                        |                       |             |                                       | 0        |         | (48)         |
| •                                       |                       |                 | storage                           |             | ear            |            |            | (48) x (49)            | ۱ =                   |             |                                       | 0        |         | (49)<br>(50) |
| • |                       |                 | eclared o                         | -           |                | or is not  |            | (40) X (40)            | _                     |             |                                       | U        |         | (30)         |
|   |                       | •               | factor fr<br>ee section           |             | e 2 (kW        | h/litre/da | ıy)        |                        |                       |             |                                       | 0        |         | (51)         |
|   | -                     | from Tal        |                                   | 311 4.0     |                |            |            |                        |                       |             |                                       | 0        |         | (52)         |
| Tempe                                   | rature fa             | actor fro       | m Table                           | 2b          |                |            |            |                        |                       |             | (                                     | 0        |         | (53)         |
|   |                       |                 | storage                           | , kWh/ye    | ear            |            |            | (47) x (51)            | x (52) x (            | 53) =       | (                                     | 0        |         | (54)         |
| `                                       | ` ' '                 | 54) in (5       | •                                 |             |                |            |            |                        |                       |             | (                                     | 0        |         | (55)         |
| г                                       | storage               | loss cal        | culated f                         | or each     | month          |            |            | ((56)m = (             | 55) × (41)ı           | n           |                                       |          | ı       |              |
| (56)m=                                  | 0                     | 0               | 0                                 | 0           | 0              | 0(50) (    | 0          | 0                      | 0 (50)                | 0           | 0                                     | 0        | : 1 1   | (56)         |
|   |                       |                 |                                   |             |                |            | 1          | · · · · ·              |                       |             |                                       | m Append | IX II   | <b></b> \    |
| (57)m=                                  | 0                     | 0               | 0                                 | 0           | 0              | 0          | 0          | 0                      | 0                     | 0           | 0                                     | 0        |         | (57)         |
| -                                       |                       | ,               | inual) fro                        |             |                |            | <b>/</b> \ | _                      |                       |             | (                                     | 0        |         | (58)         |
| -                                       |                       |                 |                                   |             | ,              |            | . ,        | 65 × (41)<br>ng and a  |                       | r thermo    | stat)                                 |          |         |              |
| (59)m=                                  | 0                     | 0               | 0                                 | 0           | 0              | 0          | 0          | 0                      | 0                     | 0           | 0                                     | 0        |         | (59)         |
| Combi                                   | loss cal              | culated         | for each                          | month (     | (61)m =        | (60) ÷ 36  | 65 × (41)  | <br>)m                 |                       |             |                                       |          |         |              |
| (61)m=                                  | 0                     | 0               | 0                                 | 0           | 0              | 0          | 0          | 0                      | 0                     | 0           | 0                                     | 0        |         | (61)         |

| Total heat re | equired for    | water he    | eating ca   | alculated | l foi | r each mo    | nth (   | (62)r   | m =    | 0.85 × (     | 45)m -    | + (46)m +                | (57)m +     | (59)m + (61)m |      |
|---------------|----------------|-------------|-------------|-----------|-------|--------------|---------|---------|--------|--------------|-----------|--------------------------|-------------|---------------|------|
| (62)m= 127.7  | 71 111.7       | 115.26      | 100.49      | 96.42     | 8     | 3.2 77.      | .1      | 88.4    | 17     | 89.53        | 104.34    | 113.89                   | 123.68      |               | (62) |
| Solar DHW inp | ut calculated  | using App   | endix G oı  | Appendix  | H (   | negative qua | antity) | ) (ente | er '0' | if no solar  | contrib   | ution to wate            | er heating) |               |      |
| (add additio  | nal lines if   | FGHRS       | and/or \    | VWHRS     | ар    | plies, see   | App     | pend    | ix G   | i)           |           |                          |             |               |      |
| (63)m= 0      | 0              | 0           | 0           | 0         |       | 0 0          |         | 0       |        | 0            | 0         | 0                        | 0           |               | (63) |
| Output from   | water hea      | iter        |             |           |       |              |         |         |        |              |           |                          |             |               |      |
| (64)m= 127.7  | 71 111.7       | 115.26      | 100.49      | 96.42     | 8     | 3.2 77.      | .1      | 88.4    | 17     | 89.53        | 104.34    | 113.89                   | 123.68      |               | _    |
|               |                |             |             |           |       |              |         | (       | Outp   | ut from wa   | iter heat | er (annual) <sub>1</sub> | 12          | 1231.8        | (64) |
| Heat gains f  | rom water      | heating,    | kWh/m       | onth 0.2  | 5 ′   | [0.85 × (4   | 5)m     | + (6    | 1)m    | ] + 0.8 x    | [(46)n    | n + (57)m                | + (59)m     | ]             |      |
| (65)m= 31.9   | 3 27.92        | 28.82       | 25.12       | 24.11     | 2     | 0.8 19.2     | 28      | 22.1    | 12     | 22.38        | 26.08     | 28.47                    | 30.92       |               | (65) |
| include (5    | 7)m in cal     | culation of | of (65)m    | only if c | ylin  | der is in t  | he d    | welli   | ing o  | or hot wa    | ater is   | from com                 | munity h    | eating        |      |
| 5. Internal   | gains (see     | e Table 5   | and 5a      | ):        |       |              |         |         |        |              |           |                          |             |               |      |
| Metabolic ga  | ains (Table    | e 5), Wat   | ts          |           |       |              |         |         |        |              |           |                          |             |               |      |
| Jar           |                | Mar         | Apr         | May       | Ι,    | Jun Ju       | ال      | Αι      | Jg     | Sep          | Oct       | Nov                      | Dec         |               |      |
| (66)m= 121.9  | 121.91         | 121.91      | 121.91      | 121.91    | 12    | 1.91 121.    | .91     | 121.    | 91     | 121.91       | 121.91    | 121.91                   | 121.91      |               | (66) |
| Lighting gair | ns (calcula    | ted in Ap   | pendix      | L, equat  | ion   | L9 or L9a    | a), al  | so s    | ee T   | able 5       |           | -                        |             | •             |      |
| (67)m= 20.3   | 1 18.04        | 14.67       | 11.1        | 8.3       | 7     | 7.01 7.5     | 57      | 9.8     | 4      | 13.21        | 16.77     | 19.58                    | 20.87       |               | (67) |
| Appliances    | gains (calc    | ulated in   | Append      | dix L, eq | uati  | ion L13 or   | r L13   | 3a), a  | also   | see Tal      | ole 5     | •                        |             | •             |      |
| (68)m= 216.7  | 74 218.99      | 213.33      | 201.26      | 186.03    | 17    | 1.71 162.    | .15     | 159     | .9     | 165.57       | 177.64    | 192.87                   | 207.18      |               | (68) |
| Cooking gai   | ns (calcula    | ted in A    | pendix      | L, equa   | tion  | L15 or L1    | 15a),   | , also  | o se   | e Table      | 5         |                          |             |               |      |
| (69)m= 35.1   | <del>`</del>   | 35.19       | 35.19       | 35.19     | т —   | 5.19 35.     | Ť       | 35.1    |        | 35.19        | 35.19     | 35.19                    | 35.19       |               | (69) |
| Pumps and     | fans gains     | (Table 5    | 5a)         |           |       |              |         |         |        |              |           |                          |             | ı             |      |
| (70)m= 0      | 0              | 0           | 0           | 0         |       | 0 0          | )       | 0       |        | 0            | 0         | 0                        | 0           |               | (70) |
| Losses e.g.   | evaporation    | n (negat    | tive valu   | es) (Tab  | le 5  |              |         |         | - 1    |              |           |                          |             | I             |      |
| (71)m= -97.5  | <del></del>    | -97.53      | -97.53      | -97.53    | _     | 7.53 -97.    | .53     | -97.    | 53     | -97.53       | -97.53    | -97.53                   | -97.53      |               | (71) |
| Water heati   | ng gains (1    | rable 5)    |             |           | -     | Į.           |         |         | - 1    |              |           |                          |             | ı             |      |
| (72)m= 42.9   | <del></del>    | 38.73       | 34.89       | 32.4      | 28    | 8.89 25.9    | 91      | 29.7    | 73     | 31.09        | 35.06     | 39.55                    | 41.56       |               | (72) |
| Total intern  | -!             |             |             |           |       | (66)m + (6   | 67)m    | + (68   | )m +   | (69)m + (    | 70)m +    | (71)m + (72)             |             |               |      |
| (73)m= 339.5  | _ <del>-</del> | 326.3       | 306.83      | 286.3     | 26    | 7.18 255     | 5.2     | 259.    | 04     | 269.44       | 289.04    | 311.56                   | 329.18      |               | (73) |
| 6. Solar ga   | ins:           |             |             |           |       |              |         |         |        |              |           |                          |             |               |      |
| Solar gains a | re calculated  | using sola  | r flux from | Table 6a  | and   | associated e | equat   | ions t  | o cor  | overt to the | e applica | able orientat            | ion.        |               |      |
| Orientation:  |                |             | Area        |           |       | Flux         |         |         |        | g_           |           | FF                       |             | Gains         |      |
|               | Table 6d       |             | m²          |           |       | Table 6      | a       |         | Ta     | able 6b      | •         | Table 6c                 |             | (W)           |      |
| South 0.9     | x 0.77         | Х           | 12.         | 15        | x [   | 46.75        |         | x       |        | 0.63         | x         | 0.7                      | =           | 173.6         | (78) |
| South 0.9     | x 0.77         | x           | 12.         | 15        | x     | 76.57        |         | х       |        | 0.63         | x         | 0.7                      | =           | 284.31        | (78) |
| South 0.9     | × 0.77         | Х           | 12.         | 15        | x [   | 97.53        |         | x       |        | 0.63         | ×         | 0.7                      | =           | 362.16        | (78) |
| South 0.9     | × 0.77         | x           | 12.         | 15        | x     | 110.23       |         | x       |        | 0.63         | ×         | 0.7                      |             | 409.32        | (78) |
| South 0.9     | × 0.77         | х           | 12.         | 15        | x     | 114.87       | 可       | x       |        | 0.63         | ×         | 0.7                      | =           | 426.54        | (78) |
| South 0.9     | × 0.77         | х           | 12.         | 15        | x [   | 110.55       | 一       | x       |        | 0.63         | ×         | 0.7                      | =           | 410.49        | (78) |
| South 0.9     | × 0.77         | х           | 12.         | 15        | x     | 108.01       | 一       | x       |        | 0.63         | ×         | 0.7                      | =           | 401.07        | (78) |
| South 0.9     | x 0.77         | х           | 12.         | 15        | x     | 104.89       | 一       | х       |        | 0.63         | ×         | 0.7                      | =           | 389.49        | (78) |
|               |                |             |             |           |       |              |         |         |        |              | _ '       |                          |             |               | _    |

| South   | 0.9x      | 0.77      | X                     | 12.       | 15                 | x [             | 101.89   | _ x _    | 0.63  | x           | 0.7         | =          | 378.32  | (78) |
|---------|-----------|-----------|-----------------------|-----------|--------------------|-----------------|--|----------|---|-------------|-------------|------------|---------|------|
| South   | 0.9x      | 0.77      | х                     | 12.       | 15                 | x $\overline{}$ | 82.59  | x        | 0.63  | x           | 0.7         |            | 306.66  | (78) |
| South   | 0.9x      | 0.77      | x                     | 12.       | 15                 | x $$            | 55.42  | ×        | 0.63  | x           | 0.7         |            | 205.77  | (78) |
| South   | 0.9x      | 0.77      | x                     | 12.       | 15                 | x =             | 40.4   | i x [    | 0.63  | _ x [       | 0.7         |            | 150.01  | (78) |
|         | L         |           |                       |           |                    |                 |  | _        |   |             |             |            |         |      |
| Solar   | ains in   | watts, ca | alculated             | for eac   | h month            |                 |  | (83)m =  | Sum(74)m                                      | (82)m       |             |            |         |      |
| (83)m=  | 173.6     | 284.31    | 362.16                | 409.32    | 426.54             | 410.            | 49 401.07                                      | 389.49   | 378.32  | 306.66      | 205.77      | 150.01     |         | (83) |
| Total g | ains – iı | nternal a | nd solar              | (84)m =   | = (73)m ·          | + (83)          | m , watts                                      |          | !   |             |             | !          |         |      |
| (84)m=  | 513.14    | 622.47    | 688.46                | 716.15    | 712.84             | 677.            | 67 656.27                                      | 648.5    | 647.76  | 595.7       | 517.34      | 479.19     |         | (84) |
| 7. Me   | an inter  | nal temp  | erature               | (heating  | season             | )               |  |          | •   |             | ,           | •          |         |      |
|         |           | ·         |                       |           |                    |                 | ea from Ta                                     | ble 9 T  | h1 (°C)                                       |             |             |            | 21      | (85) |
| -       |           | _         | •                     |           |                    | •               | Table 9a)                                      | D.O O, . | ( 0)  |             |             |            | 21      |      |
| Otilise | Jan       | Feb       | Mar                   | Apr       | May                | Ju              |  | Aug      | Sep   | Oct         | Nov         | Dec        |         |      |
| (86)m=  | 1         | 0.99      | 0.98                  | 0.94      | 0.85               | 0.6             | +  | 0.52     | 0.74  | 0.94        | 0.99        | 1          |         | (86) |
|         |           |           |                       |           |                    |                 |  | <u> </u> | <u> </u>                                      | 1 0.01      | 0.00        | <u> </u>   |         | ()   |
|         |           |           |                       |           |                    |                 | steps 3 to                                     | 1        |   |             |             |            | Ī       | (07) |
| (87)m=  | 20.04     | 20.23     | 20.45                 | 20.7      | 20.88              | 20.9            | 8 21   | 21       | 20.96   | 20.73       | 20.33       | 20.01      |         | (87) |
| Temp    | erature   | during h  | eating p              | eriods ir | rest of            | dwell           | ing from T                                     | able 9,  | Th2 (°C)                                      | _           |             |            |         |      |
| (88)m=  | 20.1      | 20.1      | 20.1                  | 20.12     | 20.12              | 20.1            | 4 20.14  | 20.14    | 20.13   | 20.12       | 20.12       | 20.11      |         | (88) |
| Utilisa | ation fac | tor for g | ains for i            | rest of d | welling,           | h2,m            | (see Table                                     | 9a)      |   |             |             |            |         |      |
| (89)m=  | 1         | 0.99      | 0.97                  | 0.91      | 0.8                | 0.5             | <u>`                                      </u> | 0.42     | 0.67  | 0.92        | 0.99        | 1          |         | (89) |
| Mean    | intorna   | l tompor  | ature in              | the rest  | of dwalli          | na T            | 2 (follow st                                   | one 3 to | 7 in Tah                                      | la Ocl      | !           | !          |         |      |
| (90)m=  | 19.22     | 19.41     | 19.63                 | 19.88     | 20.04              | 20.1            | <del>`</del>                                   | 20.14    |   | 19.91       | 19.53       | 19.2       |         | (90) |
| (00)    |           |           |                       |           |                    |                 |  |          |   | ļ           | ng area ÷ ( |            | 0.47    | (91) |
|         |           |           |                       |           |                    |                 |  |          |   |             | •           | ,          | 0.47    |      |
|         |           |           |                       |           |                    |                 | = fLA × T1                                     |          |   | i —         | 1           | T          | Ī       | (00) |
| (92)m=  | 19.6      | 19.79     | 20.02                 | 20.27     | 20.44              | 20.5            |  | 20.54    |   | 20.3        | 19.91       | 19.58      |         | (92) |
|         |           |           |                       |           | · ·                |                 | from Table                                     | 1        |   | r <u> </u>  | 1004        | 10.50      | 1       | (02) |
| (93)m=  | 19.6      | 19.79     | 20.02                 | 20.27     | 20.44              | 20.5            | 2 20.54  | 20.54    | 20.51   | 20.3        | 19.91       | 19.58      |         | (93) |
|         |           | ·         | uirement              |           | ra abtair          | - od ot         | otop 11 of                                     | Toblo    | Ob as the                                     | tTim /      | 76\m on     | d ro oole  | vulata  |      |
|         |           |           | emanter<br>or gains i | •         |                    | ieu ai          | step 11 of                                     | rabie    | 90, 80 (112                                   | at 11,111=( | 76)III an   | u re-caic  | uiale   |      |
|         | Jan       | Feb       | Mar                   | Apr       | May                | Ju              | n Jul  | Aug      | Sep   | Oct         | Nov         | Dec        |         |      |
| Utilisa | ation fac |           | ains, hm              | •         |                    |                 |  | `        | <u>, 1                                   </u> | !           | 1           | 1          |         |      |
| (94)m=  | 1         | 0.99      | 0.97                  | 0.92      | 0.82               | 0.6             | 3 0.44   | 0.47     | 0.7   | 0.92        | 0.99        | 1          |         | (94) |
| Usefu   | ıl gains, | hmGm .    | , W = (94             | 1)m x (8  | 4)m                |                 |  |          | <b>!</b>                                      |             |             |            | l       |      |
| (95)m=  | 510.68    | 613.81    | 665.19                | 657.7     | 581.96             | 424.            | 94 289.21                                      | 302.4    | 7 452.69                                      | 550.93      | 510.99      | 477.58     |         | (95) |
| Month   | nly avera | age exte  | rnal tem              | perature  | from Ta            | able 8          | 3  | •        | •   | •           | •           | •          |         |      |
| (96)m=  | 4.3       | 4.9       | 6.5                   | 8.9       | 11.7               | 14.0            | 6 16.6   | 16.4     | 14.1  | 10.6        | 7.1         | 4.2        |         | (96) |
| Heat    | loss rate | for mea   | an intern             | al tempe  | erature,           | Lm , ۱          | N = [(39)m]                                    | x [(93)  | m– (96)m                                      | ]           | -           |            | •       |      |
| (97)m=  | 1187.48   | 1150.87   | 1040.08               | 856.9     | 656.09             | 436.            | 96 290.49                                      | 304.20   | 475.87  | 728.19      | 969.36      | 1173.52    |         | (97) |
| Space   | e heatin  | g require | ement fo              | r each n  | nonth, k           | /Vh/m           | onth = 0.0                                     | 24 x [(9 | 7)m – (95                                     | )m] x (4    | 1)m         |            | •       |      |
| (98)m=  | 503.54    | 360.9     | 278.92                | 143.42    | 55.15              | 0               | 0  | 0        | 0   | 131.88      | 330.03      | 517.78     |         |      |
|         |           |           |                       |           |                    |                 |  | To       | tal per year                                  | (kWh/yea    | r) = Sum(9  | 8)15,912 = | 2321.62 | (98) |
| Space   | e heatin  | g require | ement in              | kWh/m²    | <sup>2</sup> /year |                 |  |          |   |             |             |            | 29.49   | (99) |
| •       |           | •         |                       |           | -                  |                 |  |          |   |             |             |            |         |      |

| 8c. Sp  | pace co   | oling req  | uiremer    | nt        |           |           |           |             |           |              |           |          |        |          |
|---|---|------------|------------|-----------|-----------|-----------|-----------|-------------|-----------|--------------|-----------|----------|--------|----------|
| Calcu   | lated fo  | r June, J  | luly and   | August.   | See Tal   | ole 10b   |           |             |           |              |           |          | •      |          |
|   | Jan   | Feb        | Mar        | Apr       | May       | Jun       | Jul       | Aug         | Sep       | Oct          | Nov       | Dec      |        |          |
| Heat I  | oss rate  | Lm (ca     | lculated   | using 2   | 5°C inter | nal temp  | erature   | and exte    | ernal ten | nperatur     | e from T  | able 10) |        |          |
| (100)m=   | 0   | 0          | 0          | 0         | 0         | 693.26    | 545.76    | 558.61      | 0         | 0            | 0         | 0        |        | (100)    |
| Utilisa   | ition fac   | tor for lo | ss hm      |           |           |           |           |             |           |              |           |          |        |          |
| (101)m=   | 0   | 0          | 0          | 0         | 0         | 0.94      | 0.97      | 0.97        | 0         | 0            | 0         | 0        |        | (101)    |
| Usefu   | l loss, h   | mLm (V     | /atts) = ( | (100)m x  | (101)m    |           |           |             |           |              |           |          | •      |          |
| (102)m=   | 0   | 0          | 0          | 0         | 0         | 649.82    | 531.53    | 541.93      | 0         | 0            | 0         | 0        |        | (102)    |
| Gains   | (solar o  | gains cal  | culated    | for appli | cable we  | eather re | gion, se  | e Table     | 10)       |              |           |          |        |          |
| (103)m=   | 0   | 0          | 0          | 0         | 0         | 883.32    | 856.47    | 849.08      | 0         | 0            | 0         | 0        |        | (103)    |
| •   | Space cooling requirement for month, whole dwelling, continuous ( $kWh$ ) = $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m < $3 \times (98)m$ |            |            |           |           |           |           |             |           |              |           |          |        |          |
| set (104)m to zero if (104)m < $3 \times (98)$ m  (104)m=  0 0 0 0 168.12 241.75 228.51 0 0 0 0 |   |            |            |           |           |           |           |             |           |              |           |          |        |          |
| -   |   |            |            |           |           |           |           |             | Total     | = Sum(       | 104)      | =        | 638.38 | (104)    |
| Cooled  | fraction  | า          |            |           |           |           |           |             | f C =     | cooled       | area ÷ (4 | 4) =     | 1      | (105)    |
| r   |   | actor (Ta  | able 10b   | )         |           |           |           |             |           |              |           |          | 1      |          |
| (106)m=   | 0   | 0          | 0          | 0         | 0         | 0.25      | 0.25      | 0.25        | 0         | 0            | 0         | 0        |        | _        |
| _   |   |            |            |           |           |           |           |             | Total     | l = Sum(     | 104)      | =        | 0      | (106)    |
| · .   |   | requirer   |            |           |           |           |           |             |           |              |           | ı        |        |          |
| (107)m=   | 0   | 0          | 0          | 0         | 0         | 42.03     | 60.44     | 57.13       | 0         | 0            | 0         | 0        |        | <b>–</b> |
|   |   |            |            |           |           |           |           |             | Total     | = Sum(       | 107)      | =        | 159.6  | (107)    |
| Space   | cooling   | requirer   | nent in k  | :Wh/m²/y  | /ear      |           |           |             | (107)     | $\div$ (4) = |           |          | 2.03   | (108)    |
| 8f. Fab   | ric Ener  | rgy Effici | ency (ca   | alculated | only un   | der spec  | cial cond | litions, se | ee sectic | on 11)       |           |          |        |          |
| Fabrio  | Energy  | y Efficier | псу        |           |           |           |           |             | (99) -    | + (108) =    | =         |          | 31.52  | (109)    |
| Targe   | t Fabri   | c Energ    | y Efficie  | ency (TF  | EE)       |           |           |             |           |              |           |          | 36.25  | (109)    |

|  |                              |                     | llser F         | Details:    |              |              |          |           |               |          |
|--|------------------------------|---------------------|-----------------|-------------|--------------|--------------|----------|-----------|---------------|----------|
| Assessor Name:                                     | John Ashe                    |                     | OSCI L          | Strom       | a Nium       | hor.         |          | STDO      | 031268        |          |
| Software Name:                                     | Stroma FSAP                  | 2012                |                 | Softwa      |              |              |          |           | on: 1.0.5.8   |          |
|  |                              |                     | roperty         | Address     |              |              | ETTS W   |           |               |          |
| Address :  |                              |                     |                 |             |              |              |          |           |               |          |
| 1. Overall dwelling dime                           | ensions:                     |                     |                 |             |              |              |          |           |               |          |
| 0 40   |                              |                     |                 | a(m²)       | 1            | Av. He       | ight(m)  | 1         | Volume(m³     | _        |
| Ground floor                                       |                              |                     | 7               | 78.72       | (1a) x       | 2            | .66      | (2a) =    | 209.4         | (3a)     |
| Total floor area TFA = (1                          | a)+(1b)+(1c)+(1d)-           | +(1e)+(1r           | n) <del>7</del> | 78.72       | (4)          |              |          |           |               |          |
| Dwelling volume                                    |                              |                     |                 |             | (3a)+(3b     | )+(3c)+(3d   | l)+(3e)+ | .(3n) =   | 209.4         | (5)      |
| 2. Ventilation rate:                               |                              |                     |                 |             |              |              |          |           |               |          |
|  | main<br>heating              | secondar<br>heating | У               | other       |              | total        |          |           | m³ per hou    | r        |
| Number of chimneys                                 | 0                            |                     | +               | 0           | ] = [        | 0            | X 4      | 40 =      | 0             | (6a)     |
| Number of open flues                               | 0                            | 0                   | Ī + [           | 0           | Ī <b>=</b> [ | 0            | x        | 20 =      | 0             | (6b)     |
| Number of intermittent fa                          | ans                          |                     |                 |             |              | 3            | x .      | 10 =      | 30            | (7a)     |
| Number of passive vents                            | <b>S</b>                     |                     |                 |             | F            | 0            | x .      | 10 =      | 0             |          |
| Number of flueless gas f                           | ires                         |                     |                 |             | F            | 0            | X        | 40 =      | 0             | (7c)     |
| gae i  |                              |                     |                 |             | L            |              |          |           |               |          |
|  |                              |                     |                 |             |              |              |          | Air ch    | nanges per ho | ur       |
| Infiltration due to chimne                         | ys, flues and fans           | = (6a)+(6b)+(7      | a)+(7b)+(       | (7c) =      | Γ            | 30           |          | ÷ (5) =   | 0.14          | (8)      |
| If a pressurisation test has b                     |                              | ended, procee       | d to (17),      | otherwise o | continue fr  | om (9) to (  | (16)     |           |               | <u>-</u> |
| Number of storeys in t                             | he dwelling (ns)             |                     |                 |             |              |              |          |           | 0             | (9)      |
| Additional infiltration Structural infiltration: 0 | OF for atool or time         | aar frama ar        | 0 2E to         | r maaan     | m. conotr    | ustion       | [(9)     | -1]x0.1 = | 0             | (10)     |
| if both types of wall are p                        |                              |                     |                 |             | •            | uction       |          |           | 0             | (11)     |
| deducting areas of openi                           | ngs); if equal user 0.35     | , ,                 | J               |             | ,            |              |          |           |               | _        |
| If suspended wooden                                | •                            | ,                   | .1 (seale       | ed), else   | enter 0      |              |          |           | 0             | (12)     |
| If no draught lobby, en                            | •                            |                     |                 |             |              |              |          |           | 0             | (13)     |
| Percentage of window Window infiltration           | s and doors draugi           | nt stripped         |                 | 0.25 - [0.2 | ) v (14) ± 1 | 1001 -       |          |           | 0             | = (14)   |
| Infiltration rate                                  |                              |                     |                 | •           | . ,          | 12) + (13) - | + (15) = |           | 0             | (15)     |
| Air permeability value,                            | a50. expressed in            | cubic metre         | s per ho        |             |              |              |          | area      | 5             | (17)     |
| If based on air permeabi                           | •                            |                     | •               | •           | •            |              |          |           | 0.39          | (18)     |
| Air permeability value applie                      | -                            |                     |                 |             |              | is being u   | sed      |           |               |          |
| Number of sides sheltered                          | ed                           |                     |                 | (00)        | TO 075 (4    | 10)1         |          |           | 0             | (19)     |
| Shelter factor                                     |                              |                     |                 | (20) = 1 -  |              | 19)] =       |          |           | 1             | (20)     |
| Infiltration rate incorpora                        | •                            |                     |                 | (21) = (18  | ) X (20) =   |              |          |           | 0.39          | (21)     |
| Infiltration rate modified t                       | <del></del>                  | 1                   | 1               | 1 1         | Con          | Oct          | Nov      | Doo       | 1             |          |
| Jan Feb  |                              | lay Jun             | Jul             | Aug         | Sep          | Oct          | Nov      | Dec       |               |          |
| Monthly average wind sp (22)m= 5.1 5               | beed from Table 7 4.9 4.4 4. | 3 3.8               | 3.8             | 3.7         | 4            | 4.3          | 4.5      | 4.7       | ]             |          |
| (22)111= 3.1 3                                     | 4.4 4.                       | 3.0                 | 3.0             | 3.1         | <u> </u>     | 4.3          | 4.0      | 4.7       | I             |          |
| Wind Factor (22a)m = (2                            | 2)m ÷ 4                      |                     |                 |             |              |              |          |           | _             |          |
| (22a)m= 1.27 1.25                                  | 1.23 1.1 1.0                 | 0.95                | 0.95            | 0.92        | 1            | 1.08         | 1.12     | 1.18      |               |          |

| Adjusted infiltr                                      | ation rat                 | e (allowi  | ing for sh   | nelter an   | d wind s    | speed) =                    | : (21a) x     | (22a)m      |                   |            |           |                       |             |
|---|---------------------------|------------|--------------|-------------|-------------|-----------------------------|---------------|-------------|-------------------|------------|-----------|-----------------------|-------------|
| 0.5   | 0.49                      | 0.48       | 0.43         | 0.42        | 0.37        | 0.37                        | 0.36          | 0.39        | 0.42              | 0.44       | 0.46      |                       |             |
| Calculate effe  |                           | _          | rate for t   | he appli    | cable ca    | se                          | •             |             |                   |            |           |                       |             |
| If mechanical If exhaust air h                        |                           |            | andiv N (2   | 3h) - (23s  | a) v Emy (e | aguation (I                 | N5N othe      | nwica (23h  | n) = (23a)        |            |           | 0                     | (23         |
| If balanced with                                      |                           | 0          |              | , ,         | ,           | . `                         | ,, .          | ,           | ) = (20a)         |            |           | 0                     | (23         |
| a) If balance   |                           | •          | •            | ŭ           |             | ,                           |               | ,           | 2h\m + (1         | 72h) [     | 1 (220)   | 0 . 1001              | (23         |
| (24a)m= 0   | 0                         | 0          | 0            | 0           | 0           | 0                           | 0             | 0           | 0                 | 0          | 0         | <del>-</del> 100]<br> | (24         |
| b) If balance   |                           |            |              |             |             |                             |               |             |                   |            |           | J                     | `           |
| 24b)m= 0  | 0                         | 0          | 0            | 0           | 0           | 0                           | 0             | 0           | 0                 | 0          | 0         | ]                     | (24         |
| c) If whole h   | ıouse ex                  | tract ver  | ntilation o  | r positiv   | /e input v  | ventilatio                  | on from (     | utside      |                   |            | Į         | ı                     |             |
| if (22b)r   | n < 0.5 ×                 | د (23b), t | then (24)    | c) = (23b   | o); other   | wise (24                    | c) = (22h     | o) m + 0    | .5 × (23b         | )          |           |                       |             |
| 24c)m= 0  | 0                         | 0          | 0            | 0           | 0           | 0                           | 0             | 0           | 0                 | 0          | 0         |                       | (24         |
| d) If natural<br>if (22b)r                            | ventilation $n = 1$ , the |            |              |             |             |                             |               |             | 0.5]              |            |           |                       |             |
| (24d)m= 0.63  | 0.62                      | 0.62       | 0.59         | 0.59        | 0.57        | 0.57                        | 0.57          | 0.58        | 0.59              | 0.6        | 0.61      |                       | (24         |
| Effective air   | change                    | rate - er  | nter (24a    | ) or (24k   | o) or (24   | c) or (24                   | ld) in box    | (25)        |                   |            | •         | •                     |             |
| (25)m= 0.63   | 0.62                      | 0.62       | 0.59         | 0.59        | 0.57        | 0.57                        | 0.57          | 0.58        | 0.59              | 0.6        | 0.61      |                       | (25         |
| 3. Heat losse   | e and he                  | at loss i  | naramet      | ar:         |             |                             |               |             |                   |            |           |                       |             |
|   | S and ne                  | ·          | Openin       |             | Net Ar      | .00                         | U-val         | 10          | AXU               |            | k-value   |                       | ΑΧk         |
| ELEMENT   | area                      |            | r            |             | A,r         |                             | W/m2          |             | (W/F              | <)         | kJ/m²-l   |                       | λλκ<br>⟨J/K |
| Vindows   |                           |            |              |             | 12.15       | <sub>5</sub> <sub>x</sub> 1 | /[1/( 0.9 )+  | 0.04] =     | 10.56             |            |           |                       | (27         |
| Floor   |                           |            |              |             | 78.72       | <u>x</u>                    | 0.13          |             | 10.2336           | <u> </u>   |           | $\neg \vdash$         | (28         |
| Walls   | 27.3                      | 34         | 12.1         | 5           | 15.19       | ) x                         | 0.15          | =           | 2.28              |            |           | $\exists$ $\Box$      | (29         |
| Total area of e                                       | elements                  | , m²       |              |             | 106.0       | 6                           |               |             |                   |            |           |                       | (3:         |
| for windows and                                       |                           |            |              |             |             | ated using                  | g formula 1   | /[(1/U-valu | ıе)+0.04] а       | s given in | paragraph | 1 3.2                 |             |
| ** include the area                                   |                           |            |              | ls and par  | titions     |                             | (00) (00)     | (00)        |                   |            |           |                       |             |
| Fabric heat los                                       |                           | ,          | U)           |             |             |                             | (26)(30)      |             | (22)              |            | (22.)     | 23.07                 | (3:         |
| Heat capacity   |                           | ` '        |              | TE 4) :     | . 1. 1/217  |                             |               | ., ,        | (30) + (32        |            | (32e) =   | 9570.6                | (34         |
| Thermal mass  | •                         | •          |              | ,           |             |                             | rooioolu thu  |             | itive Value:      |            | abla 1f   | 100                   | (3          |
| For design assess<br>an be used inste                 |                           |            |              | CONSTRUCT   | ion are noi | i kriowri pi                | recisely trie | Indicative  | e values of       | TIVIPINI   | аые п     |                       |             |
| Thermal bridge  | es : S (L                 | x Y) cal   | culated (    | using Ap    | pendix I    | K                           |               |             |                   |            |           | 15.91                 | (3          |
| f details of therma                                   | al bridging               | are not kn | own (36) =   | = 0.05 x (3 | 11)         |                             |               |             |                   |            |           |                       |             |
| Total fabric he                                       | at loss                   |            |              |             |             |                             |               | (33) +      | (36) =            |            |           | 38.98                 | (3          |
| /entilation hea                                       | at loss ca                | alculated  | monthly      | /           | ,           | ,                           |               | (38)m       | $=0.33\times($    | 25)m x (5  | )         | 1                     |             |
| Jan   | Feb                       | Mar        | Apr          | May         | Jun         | Jul                         | Aug           | Sep         | Oct               | Nov        | Dec       |                       |             |
| 38)m= 43.24   | 42.9                      | 42.57      | 41.02        | 40.73       | 39.37       | 39.37                       | 39.12         | 39.89       | 40.73             | 41.31      | 41.93     |                       | (38         |
|   | coefficier                | nt, W/K    |              |             |             |                             |               | (39)m       | = (37) + (3       | 38)m       |           | _                     |             |
| leat tr <u>ansfe</u> r o                              | 04.00                     | 81.55      | 79.99        | 79.7        | 78.35       | 78.35                       | 78.1          | 78.87       | 79.7              | 80.29      | 80.9      |                       |             |
|   | 81.88                     |            |              |             |             |                             |               |             |                   |            |           | 1                     |             |
| 39)m= 82.21   | !                         | 71 D) 744  | /m2k/        |             |             |                             |               |             | Average =         |            | 12 /12=   | 79.99                 | (39         |
| Heat transfer (39)m= 82.21  Heat loss para 40)m= 1.04 | !                         | HLP), W/   | /m²K<br>1.02 | 1.01        | 1           | 1 1                         | 0.99          |             | Average = (39)m ÷ |            | 1.03      | 79.99<br>]            | (39         |

Number of days in month (Table 1a)

| Nullibe    | ei oi day              | /S III IIIOI        | · `                     | ie ia)      | ı         | ı           | ī           | ī           | ı            | I                    | ı                                |          | 1       |              |
|------------|------------------------|---------------------|-------------------------|-------------|-----------|-------------|-------------|-------------|--------------|----------------------|----------------------------------|----------|---------|--------------|
|            | 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. Wa      | ater hea               | ting ene            | rgy requi               | irement:    |           |             |             |             |              |                      |                                  | kWh/ye   | ear:    |              |
|            |                        | ıpancy, l           |                         |             |           |             |             |             |              |                      |                                  | 44       |         | (42)         |
|            | FA > 13.9<br>FA £ 13.9 |                     | + 1.76 x                | [1 - exp    | (-0.0003  | 849 x (TI   | FA -13.9    | )2)] + 0.0  | 0013 x (     | ΓFA -13.             | 9)                               |          |         |              |
| Annua      | l averag               | e hot wa            | ater usaç               |             |           |             |             |             |              |                      |                                  | .11      |         | (43)         |
|            |                        | _                   | hot water<br>person per |             |           | -           | -           | to achieve  | a water us   | se target o          | f                                |          |         |              |
|            | Jan                    | Feb                 | Mar                     | Apr         | May       | Jun         | Jul         | Aug         | Sep          | Oct                  | Nov                              | Dec      |         |              |
| Hot wate   |                        |                     | r day for ea            |             |           |             | ļ           |             |              |                      |                                  |          |         |              |
| (44)m=     | 101.32                 | 97.63               | 93.95                   | 90.26       | 86.58     | 82.89       | 82.89       | 86.58       | 90.26        | 93.95                | 97.63                            | 101.32   |         |              |
| En a ray   | contont of             | bot water           | used sel                | audoto d ma | anthly 1  | 100 v V/d v |             | Tm / 260/   |              |                      | m(44) <sub>112</sub> =           |          | 1105.27 | (44)         |
|            |                        | 1                   | used - cal              |             |           |             |             |             |              |                      |                                  |          |         |              |
| (45)m=     | 150.25                 | 131.41              | 135.6                   | 118.22      | 113.44    | 97.89       | 90.71       | 104.09      | 105.33       | 122.75<br>Total = Su | 133.99<br>m(45) <sub>112</sub> = | 145.51   | 1449.18 | (45)         |
| If instan  | taneous w              | ater heatii         | ng at point             | of use (no  | hot water | r storage), | enter 0 in  | boxes (46   |              | rotar – ou           | 111(40)112 -                     |          | 1440.10 | (```         |
| (46)m=     | 0                      | 0                   | 0                       | 0           | 0         | 0           | 0           | 0           | 0            | 0                    | 0                                | 0        |         | (46)         |
|            | storage                |                     | \ in aludin             | .a. opv. o  | olor or M | WALDO       | otorogo     | within o    | ama vaa      | ool                  |                                  |          | ·<br>   | (47)         |
| •          |                        | , ,                 | ) includin<br>and no ta | •           |           |             | _           |             | anie ves     | SEI                  |                                  | 0        |         | (47)         |
|            | •                      | -                   | hot wate                |             | -         |             |             | ` '         | ers) ente    | er '0' in (          | 47)                              |          |         |              |
|            | storage                |                     |                         |             |           |             |             |             |              |                      |                                  |          |         |              |
|            |                        |                     | eclared l               |             | or is kno | wn (kWl     | n/day):     |             |              |                      |                                  | 0        |         | (48)         |
| •          |                        |                     | m Table                 |             |           |             |             | (10)        |              |                      |                                  | 0        |         | (49)         |
| ٠.         |                        |                     | r storage<br>eclared o  | -           |           | or is not   |             | (48) x (49) | ) =          |                      |                                  | 0        |         | (50)         |
|            |                        |                     | factor fr               |             |           |             |             |             |              |                      |                                  | 0        |         | (51)         |
|            |                        | eating s<br>from Ta | see section             | on 4.3      |           |             |             |             |              |                      |                                  |          | l       | (50)         |
|            |                        |                     | m Table                 | 2b          |           |             |             |             |              |                      | -                                | 0<br>0   |         | (52)<br>(53) |
| -          |                        |                     | · storage               |             | ear       |             |             | (47) x (51) | ) x (52) x ( | 53) =                |                                  | 0        |         | (54)         |
| Enter      | (50) or (              | (54) in (5          | 55)                     |             |           |             |             |             |              |                      |                                  | 0        |         | (55)         |
| Water      | storage                | loss cal            | culated f               | for each    | month     |             |             | ((56)m = (  | 55) × (41)   | m                    |                                  |          |         |              |
| (56)m=     | 0                      | 0                   | 0                       | 0           | 0         | 0           | 0           | 0           | 0            | 0                    | 0                                | 0        |         | (56)         |
| If cylinde | er contains            | s dedicate          | d solar sto             | rage, (57)ı | m = (56)m | x [(50) – ( | [H11)] ÷ (5 | 0), else (5 | 7)m = (56)   | m where (            | H11) is fro                      | m Append | ix H    |              |
| (57)m=     | 0                      | 0                   | 0                       | 0           | 0         | 0           | 0           | 0           | 0            | 0                    | 0                                | 0        |         | (57)         |
|            | •                      | `                   | nnual) fro              |             |           |             |             |             |              |                      |                                  | 0        |         | (58)         |
|            | -                      |                     | culated trom Tab        |             |           | •           | . ,         | , ,         |              | r thormo             | etat)                            |          |         |              |
| (59)m=     |                        | 0                   | 0                       | 0           | 0         | 0           | 0           |             | 0            | 0                    | 0<br>0                           | 0        |         | (59)         |
|            |                        |                     | for each                | <u> </u>    | <u> </u>  | <u> </u>    | <u> </u>    | <u> </u>    |              |                      |                                  |          |         | , ,          |
| (61)m=     | 0                      | o 0                 | or each                 | 0           | 0         | (60) ÷ 30   | 05 × (41)   | 0           | 0            | 0                    | 0                                | 0        |         | (61)         |
| ( )        | <u> </u>               | L                   |                         | L           | <u> </u>  | <u> </u>    | <u> </u>    | <u> </u>    | <u> </u>     | L                    |                                  |          | I       | ()           |

| Total heat required for water heating calculated for each month (62)m = 0.8  | 85 × (45)m + (46)m + (57)m + (59)m + (61)m            |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| (62)m= 127.71 111.7 115.26 100.49 96.42 83.2 77.1 88.47 8  | 9.53   104.34   113.89   123.68   (62)                |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if r  | 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 (63)  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Output from water heater   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (64)m= 127.71 111.7 115.26 100.49 96.42 83.2 77.1 88.47 8  | 9.53 104.34 113.89 123.68                             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Output f   | rom water heater (annual) <sub>112</sub> 1231.8 (64)  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] +   | 0.8 x [(46)m + (57)m + (59)m ]                        |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (65)m= 31.93 27.92 28.82 25.12 24.11 20.8 19.28 22.12 2  | 2.38 26.08 28.47 30.92 (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= 121.91 121.91 121.91 121.91 121.91 121.91 121.91 121.91 121.91 121.91 121.91  | 21.91   121.91   121.91   121.91   (66)               |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Tab  | ole 5   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (67)m= 20.31 18.04 14.67 11.1 8.3 7.01 7.57 9.84 1   | 3.21 16.77 19.58 20.87 (67)                           |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also se   | ee Table 5  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5  (68)m= 216.74 218.99 213.33 201.26 186.03 171.71 162.15 159.9 165.57 177.64 192.87 207.18 (68)  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see   | Table 5   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (69)m= 35.19 35.19 35.19 35.19 35.19 35.19 35.19 35.19 3   | 5.19 35.19 35.19 (69)                                 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pumps and fans gains (Table 5a)  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (70)m= 0 0 0 0 0 0 0 0   | 0 0 0 0 (70)  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Losses e.g. evaporation (negative values) (Table 5)  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (71)m= -97.53 -97.53 -97.53 -97.53 -97.53 -97.53 -97.53 -97.53 -97.53  | )7.53 -97.53 -97.53 (71)                              |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Water heating gains (Table 5)  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (72)m= 42.91 41.55 38.73 34.89 32.4 28.89 25.91 29.73 3  | 1.09 35.06 39.55 41.56 (72)                           |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Total internal gains = $(66)m + (67)m + (68)m + (68)m$ | 9)m + (70)m + (71)m + (72)m                           |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (73)m= 339.54 338.15 326.3 306.83 286.3 267.18 255.2 259.04 26   | 69.44 289.04 311.56 329.18 (73)                       |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6. Solar gains:  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Solar gains are calculated using solar flux from Table 6a and associated equations to conve  | ert to the applicable orientation.                    |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Orientation: Access Factor Area Flux g   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | le 6b Table 6c (W)                                    |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 63 × 0.7 = 173.6 (78)                                 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 63 × 0.7 = 284.31 (78)                                |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 63 x 0.7 = 362.16 (78)                                |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 63 × 0.7 = 409.32 (78)                                |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 63 × 0.7 = 426.54 (78)                                |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 63 × 0.7 = 410.49 (78)                                |  |  |  |  |  |  |  |  |  |  |  |  |  |
| South 0.9x 0.77 x 12.15 x 108.01 x 0.  | 63 × $0.7$ = $401.07$ (78)                            |  |  |  |  |  |  |  |  |  |  |  |  |  |
| South 0.9x 0.77 x 12.15 x 104.89 x 0   | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ |  |  |  |  |  |  |  |  |  |  |  |  |  |

| South           | 0.9x      | 0.77      | X                | 12.       | 15        | x     | 10             | 01.89     | x          |                | 0.63       | x         | 0.7         | =        | 378.32       | (78)         |
|-----------------|-----------|-----------|------------------|-----------|-----------|-------|----------------|-----------|------------|----------------|------------|-----------|-------------|----------|--------------|--------------|
| South           | 0.9x      | 0.77      | x                | 12.       | 15        | x     | 8              | 32.59     | <b>x</b> [ |                | 0.63       | x [       | 0.7         | =        | 306.66       | (78)         |
| South           | 0.9x      | 0.77      | x                | 12.       | 15        | x     | 5              | 55.42     | x          |                | 0.63       | x         | 0.7         | =        | 205.77       | (78)         |
| South           | 0.9x      | 0.77      | x                | 12.       | 15        | x     | 4              | 40.4      | x          |                | 0.63       | x         | 0.7         | _ =      | 150.01       | (78)         |
|                 | _         |           |                  |           |           | ٠     |                |           |            |                |            |           |             |          |              |              |
| Solar           | gains in  | watts, ca | alculated        | for eacl  | h month   |       |                |           | (83)m      | = St           | um(74)m .  | (82)m     |             |          |              |              |
| (83)m=          | 173.6     | 284.31    | 362.16           | 409.32    | 426.54    |       | 10.49          | 401.07    | 389.4      | 49             | 378.32     | 306.66    | 205.77      | 150.01   |              | (83)         |
| Total g         | ains – ii | nternal a | nd solar         | (84)m =   | = (73)m · | + (8  | 33)m           | , watts   | •          |                |            |           | •           | •        | <u> </u>     |              |
| (84)m=          | 513.14    | 622.47    | 688.46           | 716.15    | 712.84    | 67    | 77.67          | 656.27    | 648.       | 54             | 647.76     | 595.7     | 517.34      | 479.19   |              | (84)         |
| 7. Me           | an inter  | nal temp  | erature          | (heating  | season    | )     |                |           |            |                |            |           |             |          |              |              |
|                 |           |           | eating p         | `         |           | ,     | area f         | from Tal  | ole 9.     | Th′            | 1 (°C)     |           |             |          | 21           | (85)         |
| •               |           | J         | ains for I       |           |           | •     |                |           | ,          |                | ( )        |           |             |          |              | `            |
|                 | Jan       | Feb       | Mar              | Apr       | May       | È     | Jun            | Jul       | Au         | ıa             | Sep        | Oct       | Nov         | Dec      |              |              |
| (86)m=          | 0.96      | 0.93      | 0.89             | 0.84      | 0.75      | _     | ).62           | 0.48      | 0.5        | <del>-  </del> | 0.67       | 0.85      | 0.93        | 0.96     |              | (86)         |
| ) /<br>  Malain | :t.a      |           |                  |           | T4 //-    |       |                | 0 4       |            |                | . 0-1      |           | 1           |          |              |              |
|                 | 18.92     | 19.26     | ature in 1       |           | 20.51     | _     | w ste<br>0.81  | 20.93     |            | $\overline{}$  |            | 20.23     | 19.5        | 18.87    | 7            | (87)         |
| (87)m=          | 16.92     | 19.20     | 19.66            | 20.12     | 20.51     |       | 0.61           | 20.93     | 20.9       | ,2             | 20.74      | 20.23     | 19.5        | 10.07    |              | (07)         |
| Temp            |           | during h  | eating p         |           | rest of   | _     |                | from Ta   | ble 9      | , Th           | n2 (°C)    |           |             |          | _            |              |
| (88)m=          | 20.05     | 20.05     | 20.05            | 20.07     | 20.07     | 2     | 0.09           | 20.09     | 20.0       | 9              | 20.08      | 20.07     | 20.07       | 20.06    |              | (88)         |
| Utilisa         | ation fac | tor for g | ains for r       | est of d  | welling,  | h2,   | m (se          | ee Table  | 9a)        |                |            |           |             |          |              |              |
| (89)m=          | 0.95      | 0.92      | 0.88             | 0.81      | 0.71      | C     | 0.56           | 0.4       | 0.42       | 2              | 0.61       | 0.82      | 0.92        | 0.96     |              | (89)         |
| Mean            | interna   | l temper  | ature in         | the rest  | of dwelli | na    | T2 (f          | ollow ste | ens 3      | to 7           | ' in Tabl  | e 9c)     | •           | •        | <u> </u>     |              |
| (90)m=          | 18.15     | 18.48     | 18.87            | 19.33     | 19.7      | Ť     | 9.96           | 20.05     | 20.0       |                | 19.91      | 19.44     | 18.73       | 18.11    |              | (90)         |
| , ,             |           |           | <u> </u>         |           |           |       |                | <u> </u>  | <u> </u>   | !              | f          | LA = Livi | ng area ÷ ( | 4) =     | 0.47         | (91)         |
|                 |           |           |                  |           |           |       | ` .            |           |            |                | A) TO      |           |             |          |              | <b>」</b> ` ′ |
|                 |           |           | ature (fo        |           |           | _     | -              | i         | <u> </u>   |                |            | 40.04     | 10.00       | 10.47    | 7            | (92)         |
| (92)m=          | 18.51     | 18.84     | 19.24            | 19.7      | 20.08     |       | 0.36           | 20.47     | 20.4       |                | 20.3       | 19.81     | 19.09       | 18.47    |              | (92)         |
| (93)m=          | 18.51     | 18.84     | ne mean<br>19.24 | 19.7      | 20.08     | _     | re fro<br>0.36 | 20.47     | 20.4       |                | 20.3       | 19.81     | 19.09       | 18.47    | 7            | (93)         |
|                 |           |           |                  | 19.7      | 20.08     |       | 0.36           | 20.47     | 20.4       | ю              | 20.3       | 19.61     | 19.09       | 10.47    |              | (93)         |
|                 |           | ·         | uirement         | nnoratuu  | ro obtoir | , o d | ot et          | on 11 of  | Table      | n Oh           | o tha      | t Ti m-   | (76)m an    | d ro co  | loulata      |              |
|                 |           |           | or gains (       |           |           | ieu   | ai Sit         | ер птог   | Table      | 3 31.          | ), 50 illa | ι 11,111= | (10)III ali | u ie-ca  | iculate      |              |
|                 | Jan       | Feb       | Mar              | Apr       | May       | Γ,    | Jun            | Jul       | Au         | ıg             | Sep        | Oct       | Nov         | Dec      |              |              |
| Utilisa         | ation fac | tor for g | ains, hm         | :         |           |       |                |           |            | <u> </u>       | · ·        |           | 1           |          | _            |              |
| (94)m=          | 0.94      | 0.91      | 0.86             | 0.8       | 0.71      | С     | ).58           | 0.43      | 0.4        | 5              | 0.63       | 0.81      | 0.91        | 0.95     |              | (94)         |
| Usefu           | ıl gains, | hmGm .    | W = (94          | l)m x (84 | 4)m       | _     |                | •         |            |                |            |           | •           |          | _            |              |
| (95)m=          | 482.37    | 564.14    | 595.06           | 575.24    | 509.15    | 39    | 91.72          | 284.07    | 294.       | 74             | 407.45     | 482.66    | 471.38      | 454.45   |              | (95)         |
| Month           | nly avera | age exte  | rnal tem         | perature  | from Ta   | able  | e 8            |           |            |                |            |           |             | •        | <b>_</b>     |              |
| (96)m=          | 4.3       | 4.9       | 6.5              | 8.9       | 11.7      | 1     | 14.6           | 16.6      | 16.4       | 4              | 14.1       | 10.6      | 7.1         | 4.2      |              | (96)         |
| Heat            | loss rate | e for mea | an intern        | al tempe  | erature,  | Lm    | , W =          | =[(39)m   | x [(93     | 3)m-           | - (96)m    | ]         |             |          | _            |              |
| (97)m=          | 1168.34   | 1141.46   | 1038.97          | 864.07    | 667.76    | 45    | 51.19          | 302.87    | 316.9      | 94             | 488.71     | 733.73    | 962.57      | 1154.27  | 7            | (97)         |
| Space           | e heatin  | g require | ement fo         | r each n  | nonth, k  | Nh    | /mont          | th = 0.02 | 24 x [(    | (97)           | m – (95    | )m] x (4  | ·1)m        |          | <del>_</del> |              |
| (98)m=          | 510.36    | 387.95    | 330.27           | 207.96    | 118.01    |       | 0              | 0         | 0          |                | 0          | 186.8     | 353.66      | 520.67   |              |              |
|                 |           |           |                  |           |           |       |                |           | 1          | Γotal          | per year   | (kWh/yea  | r) = Sum(9  | 8)15,912 | 2615.67      | (98)         |
| Space           | e heatin  | g require | ement in         | kWh/m²    | /year     |       |                |           |            |                |            |           |             |          | 33.23        | (99)         |
|                 |           |           |                  |           |           |       |                |           |            |                |            |           |             |          |              | _            |

| 8c. Space co    | ooling red  | quiremer   | nt        |           |           |           |            |           |           |          |          |         |       |
|-----------------|-------------|------------|-----------|-----------|-----------|-----------|------------|-----------|-----------|----------|----------|---------|-------|
| Calculated for  | or June, c  | July and   | August.   | See Tal   | ole 10b   |           |            |           |           |          |          |         |       |
| Jan             | Feb         | Mar        | Apr       | May       | Jun       | Jul       | Aug        | Sep       | Oct       | Nov      | Dec      |         |       |
| Heat loss ra    | te Lm (ca   | lculated   | using 2   | 5°C inter | nal temp  | oerature  | and exte   | ernal ten | nperatur  | e from T | able 10) |         |       |
| (100)m= 0       | 0           | 0          | 0         | 0         | 736.48    | 579.78    | 593.55     | 0         | 0         | 0        | 0        |         | (100) |
| Utilisation fa  | ctor for lo | ss hm      |           |           |           |           |            |           |           |          |          |         |       |
| (101)m= 0       | 0           | 0          | 0         | 0         | 0.8       | 0.86      | 0.86       | 0         | 0         | 0        | 0        |         | (101) |
| Useful loss,    | hmLm (V     | Vatts) = ( | (100)m x  | (101)m    |           | _         |            |           | _         | _        |          |         |       |
| (102)m= 0       | 0           | 0          | 0         | 0         | 592.17    | 500.95    | 508.15     | 0         | 0         | 0        | 0        |         | (102) |
| Gains (solar    | gains ca    | lculated   | for appli | cable we  | eather re | gion, se  | e Table    | 10)       |           |          |          |         |       |
| (103)m= 0       | 0           | 0          | 0         | 0         | 883.32    | 856.47    | 849.08     | 0         | 0         | 0        | 0        |         | (103) |
| Space coolii    | •           |            |           |           | lwelling, | continu   | ous ( kW   | h') = 0.0 | 24 x [(10 | 03)m – ( | 102)m]   | x (41)m |       |
| set (104)m t    |             | 0          | 0 × (90   | 0         | 209.62    | 264.5     | 253.65     | 0         | 0         | 0        | 0        |         |       |
| (104)111= 0     |             |            |           |           | 200.02    | 204.0     | 200.00     |           | l = Sum(  | l        | =        | 727.77  | (104) |
| Cooled fraction | าท          |            |           |           |           |           |            |           | cooled    | ,        |          | 121.11  | (104) |
| Intermittency   |             | able 10b   | )         |           |           |           |            |           | 000104    | aroa . ( | -        | 1       | (100) |
| (106)m= 0       | 0           | 0          | 0         | 0         | 0.25      | 0.25      | 0.25       | 0         | 0         | 0        | 0        |         |       |
|                 | •           |            | -         |           | -         | -         | •          | Tota      | l = Sum(  | 104)     | =        | 0       | (106) |
| Space cooling   | g requirer  | ment for   | month =   | (104)m    | × (105)   | × (106)r  | n          |           |           |          |          | i       |       |
| (107)m= 0       | 0           | 0          | 0         | 0         | 52.41     | 66.13     | 63.41      | 0         | 0         | 0        | 0        |         |       |
|                 |             |            |           |           |           |           |            | Total     | = Sum(    | 107)     | =        | 181.94  | (107) |
| Space cooling   | g requirer  | ment in k  | kWh/m²/y  | /ear      |           |           |            | (107)     | ÷ (4) =   |          |          | 2.31    | (108) |
| 8f. Fabric Ene  | ergy Effic  | iency (ca  | alculated | only un   | der spec  | cial cond | litions, s | ee sectio | on 11)    |          |          |         | -     |
| Fabric Energ    | gy Efficie  | псу        |           |           |           |           |            | (99)      | + (108) = | =        |          | 35.54   | (109) |

|  |  | User D              | etails:                        |              |            |                 |           |              |              |
|--|--|---------------------|--------------------------------|--------------|------------|-----------------|-----------|--------------|--------------|
| Assessor Name:                                   | John Ashe  |                     | Strom                          | a Num        | ber:       |                 | STRO      | 031268       |              |
| Software Name:                                   | Stroma FSAP 2012   |                     | Softwa                         |              |            |                 | Versio    | n: 1.0.5.8   |              |
|  |  | Property            | Address                        | : Unit 7 -   | - COPPE    | ETTS W          | OOD, Lo   | ndon         |              |
| Address :  |  |                     |                                |              |            |                 |           |              |              |
| 1. Overall dwelling dime                         | nsions:  | Ara                 | n (m 2)                        |              | Av. Ua     | iaht/m)         |           | Valuma/m³    | `            |
| Ground floor                                     |  |                     | a(m²)<br>78.72                 | (1a) x       |            | ight(m)<br>:.66 | (2a) =    | Volume(m³    | )<br>(3a)    |
| Total floor area TFA = (1a                       | a)+(1b)+(1c)+(1d)+(1e)+(1  |                     |                                | (4)          |            |                 | ]` ′      |              | ` ′          |
| Dwelling volume                                  |  | <u> </u>            |                                |              | )+(3c)+(3c | d)+(3e)+        | (3n) =    | 209.4        | (5)          |
| 2. Ventilation rate:                             |  |                     |                                |              |            |                 |           |              |              |
|  | main seconda<br>heating heating  | ry                  | other                          |              | total      |                 |           | m³ per hou   | r            |
| Number of chimneys                               |  | <b>T</b> + <b>F</b> | 0                              | <b>-</b>     | 0          | X               | 40 =      | 0            | (6a)         |
| Number of open flues                             | 0 + 0  | <b>-</b>            | 0                              | Ī = Ī        | 0          | x               | 20 =      | 0            | (6b)         |
| Number of intermittent fa                        | ns   |                     |                                |              | 0          | x               | 10 =      | 0            | (7a)         |
| Number of passive vents                          |  |                     |                                | Ī            | 0          | x               | 10 =      | 0            | (7b)         |
| Number of flueless gas fi                        | res  |                     |                                | Ī            | 0          | X :             | 40 =      | 0            | (7c)         |
|  |  |                     |                                | _            |            |                 | A : l.    |              | <del>_</del> |
|  |  |                     |                                | _            |            |                 | Air ch    | anges per ho | _            |
| ·  | ys, flues and fans = (6a)+(6b)+(<br>een carried out or is intended, proced |                     |                                | continue fr  | 0          |                 | ÷ (5) =   | 0            | (8)          |
| Number of storeys in the                         |  | 50 to (11), t       | ourer wise (                   | Jonanae n    | om (9) to  | (10)            |           | 0            | (9)          |
| Additional infiltration                          | <b>3</b> ( )   |                     |                                |              |            | [(9)            | -1]x0.1 = | 0            | (10)         |
| Structural infiltration: 0                       | .25 for steel or timber frame o  | r 0.35 fo           | r masoni                       | ry constr    | ruction    |                 |           | 0            | (11)         |
| •••  | resent, use the value corresponding to                                     | o the great         | ter wall are                   | a (after     |            |                 |           |              | _            |
| deducting areas of openir  If suspended wooden f | loor, enter 0.2 (unsealed) or (  | ).1 (seale          | ed), else                      | enter 0      |            |                 |           | 0            | (12)         |
| If no draught lobby, en                          | ter 0.05, else enter 0   | `                   | ,.                             |              |            |                 |           | 0            | (13)         |
| Percentage of windows                            | s and doors draught stripped   |                     |                                |              |            |                 |           | 0            | (14)         |
| Window infiltration                              |  |                     | 0.25 - [0.2                    | ! x (14) ÷ 1 | 00] =      |                 |           | 0            | (15)         |
| Infiltration rate                                |  |                     | (8) + (10)                     | + (11) + (1  | 12) + (13) | + (15) =        |           | 0            | (16)         |
| Air permeability value,                          | q50, expressed in cubic metr   | es per ho           | our per s                      | quare m      | etre of e  | envelope        | area      | 5            | (17)         |
| If based on air permeabil                        | ity value, then $(18) = [(17) \div 20] +$                                  | (8), otherwi        | ise (18) = (                   | (16)         |            |                 |           | 0.25         | (18)         |
|  | s if a pressurisation test has been do                                     | ne or a de          | gree air pe                    | rmeability   | is being u | sed             |           |              | _            |
| Number of sides sheltere                         | d  |                     | (20) = 1 -                     | [0 075 v (4  | 10)1 –     |                 |           | 0            | (19)         |
| Shelter factor                                   | ing aboltor footor   |                     | $(20) = 1^{-2}$<br>(21) = (18) |              | 19)] =     |                 |           | 1            | (20)         |
| Infiltration rate incorporat                     |  |                     | (21) = (10)                    | )            |            |                 |           | 0.25         | (21)         |
| Infiltration rate modified for                   | Mar Apr May Jun  | Jul                 | Aug                            | Sep          | Oct        | Nov             | Dec       |              |              |
| Monthly average wind sp                          |  | 1                   |                                |              |            | 1               |           | I            |              |
| (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) = (24                          | 2)m : 4  | •                   | •                              | •            | •          | -               |           | •            |              |
| Wind Factor $(22a)m = (22a)m = 1.27$ 1.25        | 2)m ÷ 4<br>1.23  | 0.95                | 0.92                           | 1            | 1.08       | 1.12            | 1.18      |              |              |
|  |  |                     | 1                              | <u> </u>     |            | <u> </u>        | L v       | I            |              |

| 0.32   | 0.31   | 0.31                              | 0.28                              | 0.27                     | 0.24         | 0.24         | 0.23   | 0.25                                   | 0.27                             | 0.28  | 0.29  |               |       |
|--|--|-----------------------------------|-----------------------------------|--------------------------|--------------|--------------|--|--|----------------------------------|---|---|---------------|-------|
| alculate effe  |  | •                                 | rate for t                        | he appli                 | cable ca     | se           |  | ļ.                                     |                                  |   | <u> </u>  | <u> </u>      |       |
| If mechanic  |  |                                   |                                   |                          |              |              |  |  |                                  |   |   | 0.5           | (2    |
| If exhaust air h   |  | •                                 | •                                 | , ,                      | ,            | . ,          |  | ,                                      | o) = (23a)                       |   |   | 0.5           | (2    |
| If balanced wit  |  | •                                 | •                                 | Ū                        |              | `            |  | ,                                      |                                  |   |   | 77.35         | (2    |
| a) If balanc   | 1  |                                   |                                   |                          |              | <u> </u>     | <del>-                                    </del> | <del>í `</del>                         | <del> </del>                     |   | <del>- `                                   </del> | ÷ 100]<br>ı   |       |
| 4a)m= 0.43   | 0.43   | 0.42                              | 0.39                              | 0.38                     | 0.35         | 0.35         | 0.34   | 0.36                                   | 0.38                             | 0.39  | 0.41  |               | (2    |
| b) If balanc   |  |                                   |                                   |                          |              |              | <del> </del>                                     | ŕ                                      | <del>r `</del>                   |   |   | 1             |       |
| 4b)m= 0  | 0  | 0                                 | 0                                 | 0                        | 0            | 0            | 0  | 0                                      | 0                                | 0   | 0   |               | (2    |
| c) If whole I  |  |                                   |                                   | •                        | •            |              |  |  | - (00)                           |   |   |               |       |
|  | m < 0.5 ×  | <u> </u>                          |                                   | , ,                      | <u> </u>     | · ·          | ŕ  | r <del>i</del>                         | · ` ·                            |   | 1 .   | 1             | 15    |
| 4c)m= 0  | 0  | 0                                 | 0                                 | 0                        | 0            | 0            | 0  | 0                                      | 0                                | 0   | 0   |               | (2    |
| d) If natural  | ventilatio<br>m = 1, the   |                                   |                                   | •                        | •            |              |  |  | 0.51                             |   |   |               |       |
| 4d)m= 0  | T 0  | 0                                 | 0                                 | 0                        | 0            | 0            | 0.0 1 [(2  | 0                                      | 0.01                             | 0   | 0   |               | (2    |
| Effective air  | r change   | rate - er                         | ter (24a                          | or (24h                  | ) or (24)    | c) or (24    | d) in hov  | (25)                                   |                                  |   |   |               | ·     |
| 25)m= 0.43   | 0.43   | 0.42                              | 0.39                              | 0.38                     | 0.35         | 0.35         | 0.34   | 0.36                                   | 0.38                             | 0.39  | 0.41  |               | (2    |
| 5  | 1 00   | J                                 | 0.00                              | 0.00                     | 0.00         | 0.00         | 1 0.0 .  | 1 0.00                                 | 0.00                             | 0.00  | 1   |               | `     |
| B. Heat losse  | es and he  | at loss p                         | paramete                          | er:                      |              |              |  |  |                                  |   |   |               |       |
| LEMENT   | Gros   | _                                 | Openin                            |                          | Net Ar       |              | U-valı<br>W/m2                                   |  | AXU                              | <b>(</b> )  | k-value   |               | A X k |
| indows   | area   | (1112)                            | m                                 | -                        | A ,r         |              | vv/111∠<br>+( 0.9 )/1]/                          |  | (W/ł                             | \)<br>  | kJ/m²-l   | ^ r           | kJ/K  |
|  |  |                                   |                                   |                          | 12.15        | =            |  |  | 10.56                            | 亅 ,   |   |               | (2    |
| oor<br>  |  |                                   |                                   |                          | 78.72        | <u>x</u>     | 0.13   | = !                                    | 10.2336                          |   |   | ┥             | (2    |
| /alls  | 27.3   |                                   | 12.15                             | 5                        | 15.19        | ) X          | 0.15   | =                                      | 2.28                             |   |   |               | (2    |
| otal area of   | elements   | , m²                              |                                   |                          | 106.0        | 6            |  |  |                                  |   |   |               | (3    |
| for windows and include the are  |  |                                   |                                   |                          |              | ated using   | g formula 1                                      | /[(1/U-valu                            | ле)+0.04] а                      | s given in  | paragraph   | 3.2           |       |
| abric heat lo  |  |                                   |                                   | s and part               | illions      |              | (26)(30)   | ) + (32) =                             |                                  |   |   | 23.07         | (3    |
| eat capacity   |  | •                                 | <b>O</b> )                        |                          |              |              | , , , ,  |  | (30) + (32                       | 2) + (32a).   | (32e) =   | 9570.6        | (3    |
| hermal mass  | `  | ,                                 | P = Cm ÷                          | . TFA) ir                | n k.l/m²K    |              |  |  | ative Value:                     | , , ,   | ()  | 100           | (3    |
| or design asses  | •  | `                                 |                                   | ,                        |              |              | ecisely the                                      |  |                                  |   | able 1f   | 100           | (     |
| ŭ  |  |                                   |                                   |                          |              |              |  |  |                                  |   |   |               |       |
| an be used inste   | es : S (L  | x Y) cal-                         | culated i                         | ısing Ap                 | pendix ł     | <            |  |  |                                  |   |   | 15.91         | (3    |
|  | ` `  | λ . , σα.                         | odiatod t                         | 0 1                      |              |              |  |  |                                  |   |   |               |       |
| nermal bridg   | al bridging  | ,                                 |                                   | • .                      | 1)           |              |  |  |                                  |   |   |               |       |
| nermal bridg<br>details of therm<br>otal fabric he   | eat loss   | are not kn                        | own (36) =                        | = 0.05 x (3              | 1)           |              |  | (33) +                                 | - (36) =                         |   |   | 38.98         | (3    |
| hermal bridg<br>details of therm<br>otal fabric he<br>entilation he  | eat loss   | are not kn                        | own (36) =                        | = 0.05 x (3              | 1)           |              |  |  | - (36) =<br>= 0.33 × (3          | 25)m x (5)  | )   | 38.98         | (3    |
| nermal bridg<br>details of therm<br>otal fabric he   | eat loss   | are not kn                        | own (36) =                        | = 0.05 x (3              | 1)<br>Jun    | Jul          | Aug  |  |                                  | 25)m x (5)<br>Nov                                     | Dec   | 38.98         | (3    |
| nermal bridg<br>details of therm<br>otal fabric he<br>entilation he<br>Jan   | eat loss ca  | are not kn                        | own (36) =                        | : 0.05 x (3              |              | Jul<br>24.24 | Aug 23.81  | (38)m                                  | $=0.33\times(2$                  | , , ,   | 1   | 38.98         |       |
| nermal bridgedetails of thermotal fabric he entilation he Jan 29.85  | eat loss cat | alculated Mar 28.99               | own (36) =<br>  monthly<br>  Apr  | .: 0.05 x (3<br>/<br>May | Jun          |              | <del></del>                                      | (38)m<br>Sep<br>25.1                   | 0.33 × (2                        | Nov<br>27.26  | Dec   | 38.98         |       |
| nermal bridg<br>details of therm<br>otal fabric he<br>entilation he<br>Jan<br>29.85<br>eat transfer                      | eat loss cat | alculated Mar 28.99               | own (36) =<br>  monthly<br>  Apr  | .: 0.05 x (3<br>/<br>May | Jun          |              | <del></del>                                      | (38)m<br>Sep<br>25.1                   | 0.33 × (2) Oct 26.4              | Nov<br>27.26  | Dec   | 38.98         |       |
| nermal bridgedetails of thermotal fabric herentilation herentilation herentilation because 29.85 eat transfer 9)m= 68.83 | pal bridging eat loss at loss care Feb 29.42 coefficier 68.4   | alculated Mar 28.99 nt, W/K 67.96 | own (36) =  I monthly  Apr  26.83 |                          | Jun<br>24.24 | 24.24        | 23.81  | (38)m<br>Sep<br>25.1<br>(39)m<br>64.08 | Oct 26.4                         | Nov<br>27.26<br>38)m<br>66.24<br>Sum(39) <sub>1</sub> | Dec 28.12   | 38.98<br>65.7 | (3    |
| hermal bridg<br>details of therm<br>otal fabric he<br>entilation he<br>Jan<br>29.85<br>eat transfer                      | pal bridging eat loss at loss care Feb 29.42 coefficier 68.4   | alculated Mar 28.99 nt, W/K 67.96 | own (36) =  I monthly  Apr  26.83 |                          | Jun<br>24.24 | 24.24        | 23.81  | (38)m<br>Sep<br>25.1<br>(39)m<br>64.08 | Oct 26.4  1 = (37) + (37) + (37) | Nov<br>27.26<br>38)m<br>66.24<br>Sum(39) <sub>1</sub> | Dec 28.12   |               | (3    |

Number of days in month (Table 1a)

| ramo       | 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)     |
| ( )        |            | -           |             |             |                |             |             | <u> </u>    |             |             |                        |        |         |          |
| 4. Wa      | iter heat  | ing ener    | gy requi    | rement:     |                |             |             |             |             |             |                        | kWh/ye | ear:    |          |
| if TF      |            | N = 1       |             | [1 - exp    | (-0.0003       | 349 x (TF   | FA -13.9    | )2)] + 0.0  | 0013 x (1   | ΓFA -13.    |                        | 44     |         | (42)     |
|            | A £ 13.9   | ,           | ater usac   | na in litra | s nar da       | y Vd av     | orano –     | (25 x N)    | <b>+</b> 36 |             |                        | 44     |         | (42)     |
| Reduce     | the annua  | l average   | hot water   | usage by    | 5% if the a    |             | designed t  | to achieve  |             | se target o |                        | .11    |         | (43)     |
|            | Jan        | Feb         | Mar         | Apr         | May            | Jun         | Jul         | Aug         | Sep         | Oct         | Nov                    | Dec    |         |          |
| Hot wate   |            |             |             |             | ,              | ctor from 7 |             |             |             | l           | l                      |        |         |          |
| (44)m=     | 101.32     | 97.63       | 93.95       | 90.26       | 86.58          | 82.89       | 82.89       | 86.58       | 90.26       | 93.95       | 97.63                  | 101.32 |         |          |
| _          |            |             |             |             |                |             | _           | ,           |             |             | m(44) <sub>112</sub> = |        | 1105.27 | (44)     |
| Energy (   | content of | hot water   | used - cal  | culated mo  | onthly = $4$ . | 190 x Vd,r  | n x nm x E  |             | ) kWh/mon   | ith (see Ta | ables 1b, 1            | c, 1d) | ı       |          |
| (45)m=     | 150.25     | 131.41      | 135.6       | 118.22      | 113.44         | 97.89       | 90.71       | 104.09      | 105.33      | 122.75      | 133.99                 | 145.51 |         | <b>¬</b> |
| If instant | taneous w  | ater heatii | na at point | of use (no  | hot water      | r storage). | enter () in | boxes (46)  |             | Total = Su  | m(45) <sub>112</sub> = | =      | 1449.18 | (45)     |
| (46)m=     |            | 19.71       | 20.34       | 17.73       | 17.02          | 14.68       | 13.61       | 15.61       | 15.8        | 18.41       | 20.1                   | 21.83  |         | (46)     |
| ` '        | storage    |             | 20.34       | 17.73       | 17.02          | 14.00       | 13.01       | 15.61       | 10.0        | 10.41       | 20.1                   | 21.03  |         | (40)     |
|            | •          |             | includin    | g any so    | olar or W      | /WHRS       | storage     | within sa   | ame ves     | sel         |                        | 0      |         | (47)     |
| If comr    | munity h   | eating a    | nd no ta    | nk in dw    | elling, e      | nter 110    | litres in   | (47)        |             |             |                        |        | l       |          |
| Otherw     | vise if no | stored      | hot wate    | er (this in | ıcludes i      | nstantar    | neous co    | mbi boil    | ers) ente   | er '0' in ( | 47)                    |        |         |          |
|            | storage    |             |             | (           |                | - /1.14/1   | /.l- \      |             |             |             |                        |        | l       |          |
| •          |            |             |             |             | or is kno      | wn (kWh     | n/day):     |             |             |             |                        | 0      |         | (48)     |
| •          |            |             | m Table     |             |                |             |             |             |             |             |                        | 0      |         | (49)     |
| •          |            |             | storage     | -           |                | or is not   |             | (48) x (49) | ) =         |             | 1                      | 10     |         | (50)     |
| •          |            |             |             | -           |                | h/litre/da  |             |             |             |             | 0.                     | 02     |         | (51)     |
| If comr    | munity h   | eating s    | ee secti    | on 4.3      |                |             |             |             |             |             |                        |        |         |          |
|            | e factor   |             |             |             |                |             |             |             |             |             | 1.                     | 03     |         | (52)     |
| •          |            |             | m Table     |             |                |             |             |             |             |             | 0                      | .6     |         | (53)     |
| •          |            |             | storage     | , kWh/ye    | ear            |             |             | (47) x (51) | x (52) x (  | 53) =       | -                      | 03     |         | (54)     |
|            | (50) or (  | , ,         | •           |             |                |             |             | ((50) (     | ==> (44)    |             | 1.                     | 03     |         | (55)     |
|            |            |             | culated f   |             |                |             |             | ((56)m = (  |             |             | ı                      |        | I       |          |
| (56)m=     | 32.01      | 28.92       | 32.01       | 30.98       | 32.01          | 30.98       | 32.01       | 32.01       | 30.98       | 32.01       | 30.98                  | 32.01  | iv I I  | (56)     |
|            |            |             |             |             |                |             | · · · · ·   |             |             |             | H11) is fro            |        | ıx n    |          |
| (57)m=     | 32.01      | 28.92       | 32.01       | 30.98       | 32.01          | 30.98       | 32.01       | 32.01       | 30.98       | 32.01       | 30.98                  | 32.01  |         | (57)     |
| Primar     | y circuit  | loss (an    | inual) fro  | m Table     | 3              |             |             |             |             |             |                        | 0      |         | (58)     |
|            | •          |             |             |             | ,              | •           | . ,         | 65 × (41)   |             |             |                        |        |         |          |
| •          |            |             |             |             |                |             |             | ng and a    |             |             | <u> </u>               | 00.00  | [       | (EO)     |
| (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 cal   |             | for each    |             | (61)m =        | (60) ÷ 36   | 65 × (41)   | )m          | -           |             |                        |        | ı       |          |
| (61)m=     | 0          | 0           | 0           | 0           | 0              | 0           | 0           | 0           | 0           | 0           | 0                      | 0      |         | (61)     |

| Total he     | at requ    | ired for  | water he    | eating ca   | alculated | l fo | r each        | month      | (62)    | m =          | 0.85 × (     | 45)m     | + (46)m +                 | (57)m        | + (  | 59)m + (61)m |              |
|--------------|------------|-----------|-------------|-------------|-----------|------|---------------|------------|---------|--------------|--------------|----------|---------------------------|--------------|------|--------------|--------------|
| (62)m=       | 205.53     | 181.34    | 190.88      | 171.71      | 168.71    | 15   | 51.38         | 145.98     | 159     | .36          | 158.82       | 178.0    | 3 187.49                  | 200.7        | 8    |              | (62)         |
| Solar DHV    | V input ca | alculated | using App   | endix G oı  | Appendix  | Н(   | (negative     | e quantity | v) (ent | er '0'       | if no solar  | contrib  | ution to wate             | er heatin    | ng)  |              |              |
| (add add     | ditional   | lines if  | FGHRS       | and/or \    | VWHRS     | ap   | plies,        | see Ap     | pend    | lix G        | S)           |          |                           | _            |      |              |              |
| (63)m=       | 0          | 0         | 0           | 0           | 0         |      | 0             | 0          | 0       |              | 0            | 0        | 0                         | 0            |      |              | (63)         |
| Output f     | rom wa     | ater heat | ter         |             |           |      |               |            |         |              |              |          |                           |              |      |              |              |
| (64)m=       | 205.53     | 181.34    | 190.88      | 171.71      | 168.71    | 15   | 51.38         | 145.98     | 159     | .36          | 158.82       | 178.0    | 3 187.49                  | 200.7        | 8    |              | _            |
|              |            |           |             |             |           |      |               |            |         | Outp         | ut from wa   | ater hea | ter (annual) <sub>1</sub> | 12           |      | 2100.02      | (64)         |
| Heat gai     | ins fron   | n water   | heating,    | kWh/m       | onth 0.2  | 5 ´  | [0.85 ×       | د (45)m    | + (6    | 1)m          | ] + 0.8 x    | : [(46)ı | m + (57)m                 | + (59)       | )m ] |              |              |
| (65)m=       | 94.18      | 83.64     | 89.31       | 82.1        | 81.94     | 7    | 5.34          | 74.38      | 78.     | 83           | 77.82        | 85.04    | 87.35                     | 92.6         |      |              | (65)         |
| includ       | e (57)n    | n in calc | culation of | of (65)m    | only if c | ylir | nder is       | in the c   | llewb   | ing o        | or hot wa    | ater is  | from com                  | munity       | / he | ating        |              |
| 5. Inte      | rnal gai   | ins (see  | Table 5     | and 5a      | ):        |      |               |            |         |              |              |          |                           |              |      |              |              |
| Metabol      | ic gains   | s (Table  | 5). Wat     | ts          |           |      |               |            |         |              |              |          |                           |              |      |              |              |
|              | Jan        | Feb       | Mar         | Apr         | May       |      | Jun           | Jul        | A       | ug           | Sep          | Oct      | Nov                       | De           | С    |              |              |
| (66)m=       | 121.91     | 121.91    | 121.91      | 121.91      | 121.91    | 12   | 21.91         | 121.91     | 121     | .91          | 121.91       | 121.9    | 1 121.91                  | 121.9        | 1    |              | (66)         |
| Lighting     | gains (    | calculat  | ted in Ap   | pendix      | L, equat  | ion  | L9 or         | L9a), a    | lso s   | ee T         | Table 5      |          | •                         |              |      |              |              |
| (67)m=       | 20.31      | 18.04     | 14.67       | 11.1        | 8.3       | 7    | 7.01          | 7.57       | 9.8     | 34           | 13.21        | 16.77    | 19.58                     | 20.87        | 7    |              | (67)         |
| Appliand     | ces gair   | ns (calc  | ulated in   | Append      | dix L, eq | uat  | ion L1        | 3 or L1:   | 3a), a  | also         | see Tal      | ole 5    |                           |              |      |              |              |
| · · · –      | 216.74     | 218.99    | 213.33      | 201.26      | 186.03    |      |               | 162.15     | 159     |              | 165.57       | 177.6    | 192.87                    | 207.1        | 8    |              | (68)         |
| L<br>Cooking | gains      | (calcula  | ted in A    | ppendix     | L. egua   | tior | L15 o         | r L15a)    | . als   | o se         | e Table      | 5        | 1                         | !            |      |              |              |
| Ě            | 35.19      | 35.19     | 35.19       | 35.19       | 35.19     | _    | 5.19          | 35.19      | 35.     |              | 35.19        | 35.19    | 35.19                     | 35.19        | 9    |              | (69)         |
| Pumps a      | and fan    | s gains   | (Table 5    | <br>Ба)     |           |      |               |            |         |              | !            |          | _!                        | <u> </u>     | _    |              |              |
| (70)m=       | 0          | 0         | 0           | 0           | 0         |      | 0             | 0          | 0       |              | 0            | 0        | 0                         | 0            |      |              | (70)         |
| Losses (     | e a eva    | aporatio  | n (negat    | ive valu    | es) (Tah  | le : | <br>5)        |            |         |              |              |          |                           | l            |      |              |              |
|              | -97.53     | -97.53    | -97.53      | -97.53      | -97.53    | _    | <del></del>   | -97.53     | -97.    | .53          | -97.53       | -97.53   | 3 -97.53                  | -97.5        | 3    |              | (71)         |
| Water h      |            | nains (T  | able 5)     |             |           |      |               |            |         |              | !            |          |                           | !            |      |              |              |
| (72)m=       |            |           |             | 114.03      | 110.13    | 10   | 04.64         | 99.97      | 105     | .95          | 108.08       | 114.3    | 121.32                    | 124.4        | 7    |              | (72)         |
| Total in     | -          |           |             |             |           |      |               |            |         |              |              |          | (71)m + (72)              |              |      |              |              |
|              | 423.21     | 421.06    | 407.6       | 385.97      | 364.03    | 34   | <del>``</del> | 329.27     | 335     | <del>'</del> | 346.43       | 368.2    | <del>`</del>              | 412.0        | 9    |              | (73)         |
| 6. Sola      |            |           |             |             |           |      |               |            |         |              |              |          |                           |              |      |              |              |
|              |            |           | using sola  | r flux from | Table 6a  | and  | associa       | ted equa   | tions   | to coi       | nvert to the | e applic | able orientat             | ion.         |      |              |              |
| Orientat     | ion: A     | ccess F   | actor       | Area        |           |      | Flux          | ,          |         |              | g_           |          | FF                        |              |      | Gains        |              |
|              | T          | able 6d   |             | m²          |           |      | Tabl          | le 6a      |         | Ta           | able 6b      |          | Table 6c                  |              |      | (W)          |              |
| South        | 0.9x       | 0.77      | X           | 12.         | 15        | x    | 46            | .75        | x       |              | 0.63         | x        | 0.7                       | -            | - F  | 173.6        | (78)         |
| South        | 0.9x       | 0.77      | X           | 12.         | 15        | x    | 76            | 5.57       | x       |              | 0.63         | ×        | 0.7                       |              | - F  | 284.31       | (78)         |
| South        | 0.9x       | 0.77      | x           | 12.         | 15        | x    | 97            | 7.53       | х       |              | 0.63         | ٦ ×      | 0.7                       | <b>=</b>     | - F  | 362.16       | ]<br>(78)    |
| South        | 0.9x       | 0.77      | x           | 12.         | 15        | x    | 110           | 0.23       | x       |              | 0.63         | ×        | 0.7                       |              | -    | 409.32       | (78)         |
| South        | 0.9x       | 0.77      | x           | 12.         |           | x    |               | 4.87       | x       |              | 0.63         | ×        | 0.7                       | <b>=</b>   . | - F  | 426.54       | (78)         |
| South        | 0.9x       | 0.77      | x           | 12.         |           | x    |               | 0.55       | x       |              | 0.63         | ×        | 0.7                       | <b>-</b>     | ₌፟፟  | 410.49       | (78)         |
| South        | 0.9x       | 0.77      | x           | 12.         |           | x    |               | 3.01       | x       |              | 0.63         | ×        | 0.7                       | <del>-</del> | ₌┝   | 401.07       | (78)         |
| South        | 0.9x       | 0.77      | X           | 12.         |           | x    |               | 4.89       | x       |              | 0.63         | ا ×      | 0.7                       | ╡,           | ₌┝   | 389.49       | ]<br>(78)    |
|              |            | ****      |             |             |           |      |               |            | l l     |              |              | _        |                           |              | _    |              | <b>」</b> ` ′ |

| South   | 0.9x      | 0.77      | X          | 12.       | 15        | x            | 10     | 01.89     | <b>x</b> [ |               | 0.63       | X         | 0.7         | =           | 378.32  | (78)         |
|---------|-----------|-----------|------------|-----------|-----------|--------------|--------|-----------|------------|---------------|------------|-----------|-------------|-------------|---------|--------------|
| South   | 0.9x      | 0.77      | Х          | 12.       | 15        | x            | 8      | 2.59      | _ x [      |               | 0.63       | X         | 0.7         | =           | 306.66  | (78)         |
| South   | 0.9x      | 0.77      | Х          | 12.       | 15        | x            | 5      | 5.42      | x          |               | 0.63       | x         | 0.7         | =           | 205.77  | (78)         |
| South   | 0.9x      | 0.77      | x          | 12.       | 15        | x            | 4      | 10.4      | x          |               | 0.63       | x         | 0.7         | _ =         | 150.01  | (78)         |
|         | _         |           |            |           |           | -            |        |           | •          |               |            | _         |             |             |         | _            |
| Solar g | ains in   | watts, ca | alculated  | for eacl  | n month   |              |        |           | (83)m      | = Sı          | um(74)m .  | (82)m     |             |             |         |              |
| (83)m=  | 173.6     | 284.31    | 362.16     | 409.32    | 426.54    | 41           | 0.49   | 401.07    | 389.4      | 49            | 378.32     | 306.6     | 205.77      | 150.01      | 7       | (83)         |
| Total g | ains – ii | nternal a | nd solar   | (84)m =   | (73)m -   | + (8         | 3)m ,  | watts     | •          |               |            |           | •           | •           | -       |              |
| (84)m=  | 596.81    | 705.37    | 769.77     | 795.29    | 790.57    | 75           | 3.42   | 730.34    | 724.7      | 76            | 724.75     | 674.9     | 3 599.11    | 562.1       | 7       | (84)         |
| 7. Me   | an inter  | nal temp  | erature    | (heating  | season    | )            |        |           |            |               |            |           |             |             |         |              |
|         |           |           | eating p   | `         |           | ,            | area f | rom Tab   | ole 9.     | Th1           | 1 (°C)     |           |             |             | 21      | (85)         |
| •       |           | J         | ains for I |           |           | •            |        |           | ,          |               | ( )        |           |             |             |         | `            |
|         | Jan       | Feb       | Mar        | Apr       | May       | È            | Jun    | Jul       | Au         | ıa            | Sep        | Oct       | Nov         | Dec         | 7       |              |
| (86)m=  | 0.93      | 0.89      | 0.84       | 0.76      | 0.66      | <del>-</del> | 0.5    | 0.37      | 0.39       | Ť             | 0.56       | 0.77      | 0.89        | 0.94        | 1       | (86)         |
| NA      |           |           |            | l         | T4 /f-    |              |        |           |            | -  -  -       | . 0-1      |           |             |             | _       |              |
|         |           | 19.82     | ature in   |           | 20.77     |              |        | 20.98     |            | -             |            | 20.58     | 20.02       | 19.49       | 7       | (87)         |
| (87)m=  | 19.51     | 19.62     | 20.15      | 20.52     | 20.77     |              | 0.93   | 20.96     | 20.9       | 0             | 20.9       | 20.50     | 20.02       | 19.49       |         | (01)         |
| Temp    |           | during h  | eating p   | eriods ir | rest of   | _            | Ť      | from Ta   | ble 9      | , Th          | n2 (°C)    |           |             |             | 7       |              |
| (88)m=  | 20.19     | 20.19     | 20.2       | 20.22     | 20.23     | 20           | 0.25   | 20.25     | 20.2       | 6             | 20.24      | 20.23     | 20.22       | 20.21       |         | (88)         |
| Utilisa | ation fac | tor for g | ains for ı | est of d  | welling,  | h2,r         | m (se  | e Table   | 9a)        |               |            |           |             |             |         |              |
| (89)m=  | 0.93      | 0.88      | 0.83       | 0.74      | 0.62      | 0            | .45    | 0.31      | 0.33       | 3             | 0.51       | 0.74      | 0.88        | 0.93        | 7       | (89)         |
| Mean    | interna   | l temper  | ature in   | the rest  | of dwelli | na .         | T2 (fc | ollow ste | ens 3      | to 7          | ' in Tahl  | e 9c)     | •           | •           | -       |              |
| (90)m=  | 18.2      | 18.63     | 19.11      | 19.63     | 19.97     | Ť            | 0.19   | 20.24     | 20.2       |               | 20.14      | 19.73     | 18.95       | 18.17       | 7       | (90)         |
| ` '     |           |           |            |           |           | <u> </u>     |        |           | <u> </u>   | !             | f          | LA = Li   | <u> </u>    | 4) =        | 0.47    | (91)         |
|         | . ,       |           |            |           |           |              | \ (1   |           |            |               | A) TO      |           |             |             |         | <b>」</b> ` ′ |
|         |           |           | ature (fo  |           |           | Ť            |        |           |            | -             |            | 20.40     | 10.45       | 10.70       | ٦       | (92)         |
| (92)m=  | 18.81     | 19.19     | 19.6       | 20.05     | 20.34     |              | 0.54   | 20.59     | 20.5       |               | 20.5       | 20.13     |             | 18.79       | J       | (92)         |
| (93)m=  | 18.81     | 19.19     | ne mean    | 20.05     | 20.34     | _            | 7.54   | 20.59     | 20.5       | $\overline{}$ | 20.5       | 20.13     | 1           | 18.79       | 7       | (93)         |
|         |           |           |            | 20.05     | 20.34     |              | J.54   | 20.59     | 20.5       | 9             | 20.5       | 20.13     | 19.45       | 16.79       |         | (93)         |
|         |           |           | uirement   | mporatiu  | o obtoin  | od           | at etc | n 11 of   | Table      | ο Oh          | oo tha     | t Ti m    | =(76)m an   | d ro col    | culato  |              |
|         |           |           | or gains i |           |           | leu          | al Sie | p ii oi   | Table      | <i>3</i> 30   | ), 50 illa | L 11,111: | =(10)111 a1 | iu ie-cai   | Culate  |              |
|         | Jan       | Feb       | Mar        | Apr       | May       |              | Jun    | Jul       | Au         | ıg            | Sep        | Oct       | Nov         | Dec         | 7       |              |
| Utilisa | ation fac | tor for g | ains, hm   | :         |           | !            |        |           |            | <u> </u>      | •          |           |             | •           | _       |              |
| (94)m=  | 0.91      | 0.86      | 0.81       | 0.73      | 0.62      | 0            | .47    | 0.34      | 0.35       | 5             | 0.52       | 0.73      | 0.86        | 0.92        | 7       | (94)         |
| Usefu   | ıl gains, | hmGm .    | W = (94    | 1)m x (84 | 4)m       |              |        |           |            |               |            |           | •           |             | _       |              |
| (95)m=  | 542.04    | 609.81    | 624.05     | 581.39    | 493.27    | 35           | 5.51   | 247.01    | 256.9      | 94            | 379.73     | 494.2     | 518.03      | 516.41      | 7       | (95)         |
| Month   | nly avera | age exte  | rnal tem   | perature  | from Ta   | able         | 8      |           |            |               |            |           |             |             | _       |              |
| (96)m=  | 4.3       | 4.9       | 6.5        | 8.9       | 11.7      | 1.           | 4.6    | 16.6      | 16.4       | 4             | 14.1       | 10.6      | 7.1         | 4.2         |         | (96)         |
| Heat    | loss rate | e for mea | an intern  | al tempe  | erature,  | Lm           | , W =  | =[(39)m : | x [(93     | )m-           | - (96)m    | ]         |             | _           | _       |              |
| (97)m=  | 999       | 977.19    | 890.09     | 733.46    | 565.14    | 37           | 75.3   | 251.95    | 262.7      | 77            | 409.91     | 623.0     | 818.04      | 978.9       |         | (97)         |
| Space   | e heatin  | g require | ement fo   | r each n  | nonth, k\ | Nh/          | mont   | h = 0.02  | 24 x [(    | 97)           | m – (95    | )m] x     | 41)m        |             | _       |              |
| (98)m=  | 339.98    | 246.88    | 197.93     | 109.49    | 53.47     |              | 0      | 0         | 0          |               | 0          | 95.89     | 216         | 344.1       |         | _            |
|         |           |           |            |           |           |              |        |           | Т          | otal          | per year   | (kWh/ye   | ar) = Sum(9 | 98)15,912 = | 1603.75 | (98)         |
| Space   | e heatin  | g require | ement in   | kWh/m²    | /year     |              |        |           |            |               |            |           |             |             | 20.37   | (99)         |
|         |           |           |            |           |           |              |        |           |            |               |            |           |             |             |         | _            |

| 9b. Energy requirements – Community heating scheme  |                        |                               |                          |          |
|---|------------------------|-------------------------------|--------------------------|----------|
| This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab                            |                        |                               | 0                        | (301)    |
| Fraction of space heat from community system 1 – (301) =  |                        | ĺ                             | 1                        | (302)    |
| The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See |                        | o four other heat sources; th | he latter                | <u> </u> |
| Fraction of heat from Community boilers   |                        |                               | 0.4                      | (303a)   |
| Fraction of community heat from heat source 2   |                        | l                             | 0.4                      | (303b)   |
| Fraction of total space heat from Community boilers   |                        | (302) x (303a) =              | 0.4                      | (304a)   |
| Fraction of total space heat from community heat source 2   |                        | (302) x (303b) =              | 0.4                      | (304b)   |
| Factor for control and charging method (Table 4c(3)) for community  | heating system         |                               | 1                        | (305)    |
| Distribution loss factor (Table 12c) for community heating system   |                        |                               | 1.05                     | (306)    |
| Space heating Annual space heating requirement  |                        | [                             | kWh/yea<br>1603.75       | r<br>    |
| Space heat from Community boilers   | (98) x (304a)          | x (305) x (306) =             | 673.57                   | (307a)   |
| Space heat from heat source 2   | (98) x (304b)          | x (305) x (306) =             | 673.57                   | (307b)   |
| Efficiency of secondary/supplementary heating system in % (from   | Table 4a or Appe       | endix E)                      | 0                        | (308     |
| Space heating requirement from secondary/supplementary system   | (98) x (301) x         | (100 ÷ (308) =                | 0                        | (309)    |
| Water heating Annual water heating requirement If DHW from community scheme:  |                        | [                             | 2100.02                  |          |
| Water heat from Community boilers   | (64) x (303a)          | x (305) x (306) =             | 882.01                   | (310a    |
| Water heat from heat source 2   | (64) x (303b)          | x (305) x (306) =             | 882.01                   | (310b)   |
| Electricity used for heat distribution  | 0.01 × [(307a)(30      | 07e) + (310a)(310e)] =        | 31.11                    | (313)    |
| Cooling System Energy Efficiency Ratio  |                        |                               | 0                        | (314)    |
| Space cooling (if there is a fixed cooling system, if not enter 0)  | = (107) ÷ (31          | 4) =                          | 0                        | (315)    |
| Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out                                | side                   | [                             | 287.39                   | (330a)   |
| warm air heating system fans  |                        |                               | 0                        | (330b    |
| pump for solar water heating  |                        |                               | 0                        | (330g    |
| Total electricity for the above, kWh/year   | =(330a) + (33          | 80b) + (330g) =               | 287.39                   | (331)    |
| Energy for lighting (calculated in Appendix L)  |                        |                               | 358.61                   | (332)    |
| Electricity generated by PVs (Appendix M) (negative quantity)   |                        |                               | -768.62                  | (333)    |
| Electricity generated by wind turbine (Appendix M) (negative quant  | ity)                   |                               | 0                        | (334)    |
| 12b. CO2 Emissions – Community heating scheme   |                        |                               |                          |          |
|   | Energy<br>kWh/year     | Emission factor kg CO2/kWh    | Emissions<br>kg CO2/year |          |
| CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two   | o fuels repeat (363) t | to (366) for the second fuel  | 89                       | (367a)   |

| Efficiency of heat source 2 (%)               | If there is CHP using two fuels repeat (363) to (363) | 366) for the second f | uel | 89      | (367b) |
|---|---|-----------------------|-----|---------|--------|
| CO2 associated with heat source 1             | [(307b)+(310b)] x 100 ÷ (367b) x                      | 0.22                  | =   | 377.53  | (367)  |
| CO2 associated with heat source 2             | [(307b)+(310b)] x 100 ÷ (367b) x                      | 0.22                  | =   | 377.53  | (368)  |
| Electrical energy for heat distribution       | [(313) x  | 0.52                  | =   | 16.15   | (372)  |
| Total CO2 associated with community system    | (363)(366) + (368)(372)                               | )                     | =   | 771.22  | (373)  |
| CO2 associated with space heating (seconda    | ry) (309) x   | 0                     | =   | 0       | (374)  |
| CO2 associated with water from immersion he   | eater or instantaneous heater (312) x                 | 0.22                  | =   | 0       | (375)  |
| Total CO2 associated with space and water h   | eating (373) + (374) + (375) =                        |                       |     | 771.22  | (376)  |
| CO2 associated with electricity for pumps and | fans within dwelling (331)) x                         | 0.52                  | =   | 149.16  | (378)  |
| CO2 associated with electricity for lighting  | (332))) x   | 0.52                  | =   | 186.12  | (379)  |
| Energy saving/generation technologies (333)   | to (334) as applicable                                |                       |     |         | 7      |
| Item 1  |   | 0.52 x 0.01           | =   | -398.91 | (380)  |
| Total CO2, kg/year sum o                      | of (376)(382) =                                       |                       |     | 707.57  | (383)  |
| Dwelling CO2 Emission Rate (383)              | ÷ (4) =   |                       |     | 8.99    | (384)  |
| El rating (section 14)                        |   |                       |     | 92.34   | (385)  |

|  |  | User D        | etails:     |                     |            |          |           |               |              |
|--|--|---------------|-------------|---------------------|------------|----------|-----------|---------------|--------------|
| Assessor Name:   | John Ashe  |               | Strom       | a Num               | her:       |          | STRO      | 031268        |              |
| Software Name:   | Stroma FSAP 2012   |               | Softwa      |                     |            |          |           | n: 1.0.5.8    |              |
|  |  | Property i    | Address     | : Unit 7 -          | COPPE      | ETTS W   | OOD, Lo   | ndon          |              |
| Address :  |  |               |             |                     |            |          |           |               |              |
| 1. Overall dwelling dime                                   | ensions:   |               |             |                     |            |          |           |               |              |
| Ground floor   |  |               | a(m²)       | (1a) v              |            | ight(m)  | 7(20)     | Volume(m³     | <u>-</u>     |
|  |  |               | 8.72        | (1a) x              | 2          | .66      | (2a) =    | 209.4         | (3a)         |
| Total floor area TFA = (1                                  | a)+(1b)+(1c)+(1d)+(1e)+(1                                    | n)            | 8.72        | (4)                 |            |          |           |               |              |
| Dwelling volume  |  |               |             | (3a)+(3b            | )+(3c)+(3c | d)+(3e)+ | (3n) =    | 209.4         | (5)          |
| 2. Ventilation rate:                                       |  |               |             |                     |            |          |           |               |              |
|  | main seconda<br>heating heating                              | iry<br>       | other       | _                   | total      |          |           | m³ per hou    | r<br>        |
| 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 fa                                  | ns   |               |             | Γ                   | 3          | X        | 10 =      | 30            | (7a)         |
| Number of passive vents                                    | <b>.</b>   |               |             | Ī                   | 0          | x -      | 10 =      | 0             | (7b)         |
| Number of flueless gas fi                                  | res  |               |             | Ē                   | 0          | x        | 40 =      | 0             | (7c)         |
|  |  |               |             | _                   |            |          |           |               |              |
|  |  |               |             |                     |            |          | Air ch    | nanges per ho | our          |
| ·  | ys, flues and fans = $(6a)+(6b)+$                            |               |             |                     | 30         |          | ÷ (5) =   | 0.14          | (8)          |
| If a pressurisation test has b<br>Number of storeys in the | peen carried out or is intended, proce                       | ed to (17), o | otherwise ( | continue fr         | om (9) to  | (16)     |           |               | <b>—</b> (0) |
| Additional infiltration                                    | ne aweiling (115)  |               |             |                     |            | [(9)]    | -1]x0.1 = | 0             | (9)<br>(10)  |
|  | .25 for steel or timber frame of                             | or 0.35 for   | r masoni    | y constr            | uction     | 1(0)     |           | 0             | (11)         |
| •••  | resent, use the value corresponding                          | to the great  | er wall are | a (after            |            |          |           |               |              |
| deducting areas of openii                                  | ngs); if equal user 0.35<br>floor, enter 0.2 (unsealed) or ( | ) 1 (seale    | ad) else    | enter ()            |            |          |           | 0             | (12)         |
| If no draught lobby, en                                    | ,  | 7.1 (Joure    | , cioc      | cinci o             |            |          |           | 0             | (13)         |
| • ,  | s and doors draught stripped                                 |               |             |                     |            |          |           | 0             | (14)         |
| Window infiltration  |  |               | 0.25 - [0.2 | x (14) ÷ 1          | 00] =      |          |           | 0             | (15)         |
| Infiltration rate  |  |               | (8) + (10)  | + (11) + (1         | 12) + (13) | + (15) = |           | 0             | (16)         |
| • • •  | q50, expressed in cubic metr                                 | •             | •           | •                   | etre of e  | envelope | area      | 5             | (17)         |
| •  | ity value, then $(18) = [(17) \div 20] +$                    |               |             |                     |            |          |           | 0.39          | (18)         |
| Air permeability value applie  Number of sides sheltere    | es if a pressurisation test has been do                      | one or a deg  | gree air pe | rmeability          | is being u | sed      |           |               | (19)         |
| Shelter factor   | <del>cu</del>  |               | (20) = 1 -  | [0.0 <b>75</b> x (1 | 19)] =     |          |           | 0             | -(20)        |
| Infiltration rate incorporat                               | ting shelter factor  |               | (21) = (18  | ) x (20) =          |            |          |           | 0.39          | (21)         |
| Infiltration rate modified f                               | or monthly wind speed  |               |             |                     |            |          |           |               |              |
| Jan Feb  | Mar Apr May Jun  | Jul           | Aug         | Sep                 | Oct        | Nov      | Dec       |               |              |
| Monthly average wind sp                                    | eed 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 = (2                                    | 2)m <i>÷ 4</i>   |               |             |                     |            |          |           |               |              |
|  | 1.23 1.1 1.08 0.95   | 0.95          | 0.92        | 1                   | 1.08       | 1.12     | 1.18      | ]             |              |
| , ,,   | 1 1 1 1 1 1 1 1 1 1  | 1             |             | •                   |            |          |           | J             |              |

| aujusteu ii iiit          | ration rat               | e (allowi  | ng for sh    | nelter an   | d wind s    | speed) =   | (21a) x  | (22a)m         |  |                      |                    |               |               |
|---------------------------|--------------------------|--|--------------|-------------|-------------|--|--|----------------|--|----------------------|--------------------|---------------|---------------|
| 0.5                       | 0.49                     | 0.48   | 0.43         | 0.42        | 0.37        | 0.37   | 0.36   | 0.39           | 0.42   | 0.44                 | 0.46               | ]             |               |
| Calculate effe            |                          | -  | rate for t   | he appli    | cable ca    | se   | •  | •              | •  |                      | •                  | •             | <del></del> . |
| If mechanic               |                          |  | andiv NL (O  | ah) (aa     | s) Em. /a   | accetion (I                                      | \ E\\  | muiaa (22h     | ·) (22a)   |                      |                    | 0             | (23           |
| If exhaust air h          |                          | 0  |              | , ,         | ,           | . `  | ,, .   | ,              | )) = (23a)                                       |                      |                    | 0             | (23           |
| If balanced with          |                          | •  | •            | ŭ           |             | `  |  | ,              |  |                      |                    | 0             | (23           |
| a) If balanc              |                          | 1  |              |             |             | <del></del>                                      | <del>,                                    </del> | ŕ              | <del>,                                    </del> | <del></del>          | <del>1 ` ´</del>   | ) ÷ 100]<br>1 | (0.4          |
| 24a)m= 0                  | 0                        | 0  | 0            | 0           | 0           | 0  | 0  | 0              | 0  | 0                    | 0                  |               | (24           |
| b) If balanc              |                          |  |              |             |             | <del>-                                    </del> | <del>,                                    </del> | <del>í `</del> | <del>, ´ ` `</del>                               |                      | 1                  | 1             |               |
| 24b)m= 0                  | 0                        | 0  | 0            | 0           | 0           | 0  | 0  | 0              | 0  | 0                    | 0                  |               | (24           |
| c) If whole I             |                          |  |              | •           | •           |  |  |                |  |                      |                    |               |               |
| <u> </u>                  | m < 0.5 >                | <del>`                                    </del> | <u>`</u>     | ŕ           | <del></del> | <u> </u>   | <del>r ` ` </del>                                | ŕ              | · ` ·  | <u> </u>             | ı                  | 1             |               |
| 24c)m= 0                  | 0                        | 0  | 0            | 0           | 0           | 0  | 0  | 0              | 0  | 0                    | 0                  |               | (24           |
| d) If natural<br>if (22b) | ventilation<br>m = 1, th |  |              | •           | •           |  |  |                | 0.5]   |                      |                    | _             |               |
| 24d)m= 0.63               | 0.62                     | 0.62   | 0.59         | 0.59        | 0.57        | 0.57   | 0.57   | 0.58           | 0.59   | 0.6                  | 0.61               |               | (24           |
| Effective air             | r change                 | rate - er  | nter (24a    | ) or (24k   | o) or (24   | c) or (24  | d) in bo   | (25)           |  |                      |                    |               |               |
| 25)m= 0.63                | 0.62                     | 0.62   | 0.59         | 0.59        | 0.57        | 0.57   | 0.57   | 0.58           | 0.59   | 0.6                  | 0.61               |               | (25           |
| 3. Heat losse             | oo ond be                | oot loog i                                       | aramata      | or:         |             |  |  |                |  |                      |                    |               |               |
|                           | _                        |  |              |             | Net Ar      | 200  | U-val  | 10             | AXU  |                      | k-value            | - /           | λΧk           |
| ELEMENT                   | Gros<br>area             |  | Openin<br>m  |             | A,r         |  | W/m2   |                | (W/I   | <)                   | kJ/m²-l            |               | J/K           |
| Vindows                   |                          |  |              |             | 12.15       | <sub>5</sub> x1                                  | /[1/( 1.4 )+                                     | 0.04] =        | 16.11  |                      |                    |               | (27           |
| Floor                     |                          |  |              |             | 78.72       | <u> </u>   | 0.13   | i              | 10.2336  |                      |                    | $\neg$        | (28           |
| Nalls                     | 27.3                     | 34   | 12.1         | 5           | 15.19       | ) x  | 0.18   | = :            | 2.73   | <b>=</b>             |                    |               | (29           |
| Total area of             |                          |  |              |             | 106.0       | =  | 00   |                |  |                      |                    |               | \<br>(31      |
| for windows and           |                          |  | effective wi | ndow U-va   |             |  | a formula 1                                      | /[(1/U-valı    | ue)+0.041 a                                      | ıs aiven in          | paragraph          | 132           | (01           |
| ** include the are        |                          |  |              |             |             |  | ,  | . (            | ,  | J                    | , parragraph       |               |               |
| abric heat lo             | ss, W/K                  | = S (A x   | U)           |             |             |  | (26)(30  | + (32) =       |  |                      |                    | 29.08         | (33           |
| Heat capacity             | Cm = S                   | (Axk)  |              |             |             |  |  | ((28).         | (30) + (32                                       | 2) + (32a).          | (32e) =            | 9570.6        | (34           |
| Thermal mass              | s parame                 | eter (TMF  | P = Cm ÷     | - TFA) ir   | n kJ/m²K    |  |  | Indica         | tive Value                                       | Medium               |                    | 250           | (35           |
| or design asses           | sments wh                | ere the de                                       | tails of the | construct   | ion are no  | t known pi                                       | ecisely the                                      | e indicative   | e values of                                      | TMP in T             | able 1f            |               |               |
| can be used inste         |                          |  |              |             |             |  |  |                |  |                      |                    |               |               |
| Thermal bridg             | jes : S (L               | x Y) cal   | culated ı    | using Ap    | pendix l    | <  |  |                |  |                      |                    | 5.3           | (36           |
| f details of therm        |                          | are not kn                                       | own (36) =   | = 0.05 x (3 | 11)         |  |  | (0.0)          | (0.0)  |                      |                    |               | <del></del> . |
| Fotal fabric he           |                          |  |              |             |             |  |  |                | (36) =   | > /-                 |                    | 34.38         | (37           |
| /entilation he            | 1                        | 1  |              |             | l .         | <del></del>                                      | <b>.</b>   |                | = 0.33 × (                                       |                      | 1                  | 1             |               |
| Jan                       | Feb                      | Mar  | Apr          | May         | Jun         | Jul  | Aug  | Sep            | Oct  | Nov                  | Dec                |               | (00           |
| 38)m= 43.24               | 42.9                     | 42.57  | 41.02        | 40.73       | 39.37       | 39.37  | 39.12  | 39.89          | 40.73  | 41.31                | 41.93              | J             | (38           |
| Heat transfer             | coefficie                | nt, W/K  |              |             |             |  |  | (39)m          | = (37) + (3                                      | 38)m                 |                    |               |               |
| 39)m= 77.62               | 77.28                    | 76.95  | 75.39        | 75.1        | 73.75       | 73.75  | 73.5   | 74.27          | 75.1   | 75.69                | 76.31              |               |               |
| last lase                 | om ct - 4                | II D\ \ \  | /ma 21.4     |             |             |  |  |                | Average =  |                      | <sub>12</sub> /12= | 75.39         | (39           |
| Heat loss par             | - ·                      | <del>-                                    </del> |              | 0.05        | 001         | 001  | T 0.00   |                | = (39)m ÷  |                      | 0.07               | 1             |               |
| 40)m= 0.99                | 0.98                     | 0.98   | 0.96         | 0.95        | 0.94        | 0.94   | 0.93   | 0.94           | 0.95   | 0.96                 | 0.97               | _             |               |
|                           |                          |  |              |             |             |  |  |                | Average =  | Sum(40) <sub>1</sub> | 12 /12=            | 0.96          | (4            |

Number of days in month (Table 1a)

| Numbe      | er or day              | s in mor     | าเก (Tab    | ie ra)      |                | 1           | 1          | 1           |               |                  |                        |             | 1       |              |
|------------|------------------------|--------------|-------------|-------------|----------------|-------------|------------|-------------|---------------|------------------|------------------------|-------------|---------|--------------|
|            | 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)         |
|            |                        |              |             |             |                |             |            |             |               |                  |                        |             | •       |              |
| 1 Wa       | ter heat               | ing ener     | gy requi    | rement:     |                |             |            |             |               |                  |                        | kWh/ye      | aar:    |              |
| T. VVC     | itor ricat             | ing crici    | gy requi    | TOTTICTIL.  |                |             |            |             |               |                  |                        | ICVVII/ y C | Jar.    |              |
|            | ed occu                |              |             |             |                |             |            |             |               |                  |                        | 44          |         | (42)         |
|            |                        |              | + 1.76 x    | [1 - exp    | (-0.0003       | 349 x (TF   | FA -13.9   | )2)] + 0.0  | 0013 x (      | ΓFA -13.         | 9)                     |             | •       |              |
|            | A £ 13.9               | -            | ator usac   | ne in litre | se ner de      | y Vd av     | erade –    | (25 x N)    | <b>+</b> 36   |                  | 00                     | 4.4         |         | (42)         |
|            |                        |              |             |             |                |             |            |             | a water us    | se target o      |                        | .11         |         | (43)         |
| not more   | e that 125             | litres per p | person per  | day (all w  | ater use, l    | hot and co  | ld)        |             |               |                  |                        |             |         |              |
|            | Jan                    | Feb          | Mar         | Apr         | May            | Jun         | Jul        | Aug         | Sep           | Oct              | Nov                    | Dec         |         |              |
| Hot wate   | er usage ir            | litres per   | day for ea  |             |                | ctor from   | Table 1c x |             |               |                  |                        |             | l       |              |
| (44)m=     | 101.32                 | 97.63        | 93.95       | 90.26       | 86.58          | 82.89       | 82.89      | 86.58       | 90.26         | 93.95            | 97.63                  | 101.32      |         |              |
| ,          | I                      |              |             |             |                |             | l .        | l           |               | I<br>Total = Su  | m(44) <sub>112</sub> = |             | 1105.27 | (44)         |
| Energy o   | content of             | hot water    | used - cal  | culated mo  | onthly $= 4$ . | 190 x Vd,r  | m x nm x E | OTm / 3600  | ) kWh/mon     |                  |                        |             |         | <b>」</b> ` ` |
| (45)m=     | 150.25                 | 131.41       | 135.6       | 118.22      | 113.44         | 97.89       | 90.71      | 104.09      | 105.33        | 122.75           | 133.99                 | 145.51      |         |              |
| , ,        | ļ.                     |              |             |             |                | <u> </u>    | <u> </u>   | <u> </u>    |               | I<br>Total = Sui | m(45) <sub>112</sub> = |             | 1449.18 | (45)         |
| If instant | taneous w              | ater heatii  | ng at point | of use (no  | hot water      | storage),   | enter 0 in | boxes (46   |               |                  | , ,                    | ļ           |         | _            |
| (46)m=     | 22.54                  | 19.71        | 20.34       | 17.73       | 17.02          | 14.68       | 13.61      | 15.61       | 15.8          | 18.41            | 20.1                   | 21.83       |         | (46)         |
| Water      | storage                | loss:        |             |             |                | <u>I</u>    | ļ.         | ļ.          | ļ.            |                  |                        |             | l       |              |
| Storag     | e volum                | e (litres)   | includin    | ig any so   | olar or W      | /WHRS       | storage    | within sa   | ame ves       | sel              |                        | 150         |         | (47)         |
| If comr    | munity h               | eating a     | nd no ta    | nk in dw    | elling, e      | nter 110    | litres in  | (47)        |               |                  |                        |             |         |              |
| Otherw     | vise if no             | stored       | hot wate    | er (this in | ıcludes i      | nstantar    | neous co   | mbi boil    | ers) ente     | er '0' in (      | 47)                    |             |         |              |
|            | storage                |              |             |             |                |             |            |             |               |                  |                        |             |         |              |
| a) If m    | anufacti               | urer's de    | eclared l   | oss facto   | or is kno      | wn (kWł     | n/day):    |             |               |                  | 1.                     | 39          |         | (48)         |
| Tempe      | rature fa              | actor fro    | m Table     | 2b          |                |             |            |             |               |                  | 0.                     | 54          |         | (49)         |
| Energy     | lost fro               | m water      | storage     | , kWh/ye    | ear            |             |            | (48) x (49) | ) =           |                  | 0.                     | 75          |         | (50)         |
|            |                        |              |             | ylinder l   |                |             |            |             |               |                  |                        |             |         |              |
|            |                        |              |             | om Tabl     | e 2 (kW        | h/litre/da  | ay)        |             |               |                  | (                      | 0           |         | (51)         |
|            | nunity n<br>e factor i | •            | ee section  | on 4.3      |                |             |            |             |               |                  |                        |             | 1       | (52)         |
|            |                        |              | m Table     | 2h          |                |             |            |             |               |                  |                        | 0           |         | (52)<br>(53) |
|            |                        |              |             |             |                |             |            | (47) v (E4) | ) v (EQ) v (I | E2)              |                        |             |         | . ,          |
| •          | (50) or (              |              | •           | , kWh/ye    | zai            |             |            | (47) X (51) | ) x (52) x (  | 55) =            | -                      | 0           |         | (54)<br>(55) |
|            | . , .                  | , ,          | •           | or oach     | month          |             |            | ((EC)m - (  | EE) ~ (44);   | <b>~</b>         | 0.                     | 75          |         | (33)         |
|            |                        |              |             | or each     |                |             |            |             | 55) × (41)ı   |                  |                        |             | ı       |              |
| (56)m=     | 23.33                  | 21.07        | 23.33       | 22.58       | 23.33          | 22.58       | 23.33      | 23.33       | 22.58         | 23.33            | 22.58                  | 23.33       |         | (56)         |
| If cylinde | er contains            | dedicated    | d solar sto | rage, (57)ı | m = (56)m      | x [(50) – ( | H11)] ÷ (5 | 0), else (5 | 7)m = (56)    | m where (        | H11) is fro            | m Append    | ix H    |              |
| (57)m=     | 23.33                  | 21.07        | 23.33       | 22.58       | 23.33          | 22.58       | 23.33      | 23.33       | 22.58         | 23.33            | 22.58                  | 23.33       |         | (57)         |
| Primar     | v circuit              | loss (an     | nual) fro   | m Table     | 9 3            |             |            |             |               |                  |                        | 0           |         | (58)         |
|            | •                      | •            | •           |             |                | 59)m = (    | (58) ÷ 36  | 65 × (41)   | m             |                  |                        |             | ı       |              |
|            | •                      |              |             |             | ,              | •           | ` '        | , ,         | cylinde       | r thermo         | stat)                  |             |         |              |
| (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      | ادع دعا                | culated      | for each    | month /     | (61)m –        | (60) ± 30   | 65 × (41   | )m          | •             | •                |                        |             | •       |              |
| (61)m=     | 0                      | 0            | 0           | 0           | 0              | 00) + 30    | 0          | 0           | 0             | 0                | 0                      | 0           |         | (61)         |
| (01)111=   | Ŭ                      | U            | U           | U           |                |             | L          | L           | L             |                  | Ŭ                      | U           |         | (01)         |

| Total h  | eat requ   | uired for  | water           | he           | ating ca  | alculate | d fo     | or eacl  | h month     | (62)       | m =     | 0.85 × (    | 45)m     | + (46)m     | ı + (5             | 7)m +    | (59)m + (61)m |               |
|----------|------------|------------|-----------------|--------------|-----------|----------|----------|----------|-------------|------------|---------|-------------|----------|-------------|--------------------|----------|---------------|---------------|
| (62)m=   | 196.84     | 173.49     | 182.2           |              | 163.31    | 160.03   | 1        | 42.98    | 137.3       | 150        | .68     | 150.42      | 169.3    | 35 179.0    | 08                 | 192.1    |               | (62)          |
| Solar DF | lW input o | calculated | using A         | ope          | ndix G or | Append   | хH       | (negati  | ve quantity | /) (ent    | ter '0' | if no solai | r contri | oution to v | vater h            | neating) | '             |               |
| (add ad  | dditiona   | l lines if | FGHR            | Sa           | and/or V  | VWHR:    | S a      | pplies   | , see Ap    | pend       | dix C   | 3)          |          |             |                    |          | _             |               |
| (63)m=   | 0          | 0          | 0               |              | 0         | 0        |          | 0        | 0           | C          | )       | 0           | 0        | 0           |                    | 0        |               | (63)          |
| Output   | from wa    | ater hea   | ter             |              |           |          |          |          |             |            |         |             |          |             |                    |          |               |               |
| (64)m=   | 196.84     | 173.49     | 182.2           |              | 163.31    | 160.03   | 1        | 42.98    | 137.3       | 150        | .68     | 150.42      | 169.3    | 35 179.0    | 08                 | 192.1    |               |               |
| •        |            |            |                 |              |           |          |          |          | -           | -          | Outp    | out from wa | ater he  | ater (annu  | al) <sub>112</sub> |          | 1997.8        | (64)          |
| Heat g   | ains froi  | m water    | heatin          | g, l         | kWh/mo    | onth 0.2 | 25 ´     | [0.85    | × (45)m     | + (6       | 31)m    | n] + 0.8 x  | (46)     | m + (57     | )m +               | (59)m    | 1             |               |
| (65)m=   | 87.23      | 77.36      | 82.36           |              | 75.38     | 74.99    | 1        | 68.62    | 67.44       | 71.        | 88      | 71.1        | 78.0     | 9 80.6      | 3 8                | 85.66    |               | (65)          |
| inclu    | de (57)ı   | m in cald  | culation        | ۱ 0          | f (65)m   | only if  | cyli     | nder is  | s in the o  | llewb      | ling    | or hot w    | ater is  | from co     | omm                | unity h  | eating        |               |
| 5. Int   | ernal ga   | ains (see  | Table           | 5            | and 5a    | ):       |          |          |             |            |         |             |          |             |                    |          |               |               |
|          |            | s (Table   |                 |              | ·         |          |          |          |             |            |         |             |          |             |                    |          |               |               |
| Wiotabe  | Jan        | Feb        | Mai             | Т            | Apr       | May      | Τ        | Jun      | Jul         | А          | ug      | Sep         | Oc       | t No        | ov                 | Dec      | 1             |               |
| (66)m=   | 121.91     | 121.91     | 121.9           | 1            | 121.91    | 121.91   | 1        | 21.91    | 121.91      | 121        | _       | 121.91      | 121.9    | 1 121.9     | 91 1               | 21.91    |               | (66)          |
| Lightin  | g gains    | (calcula   | ted in <i>i</i> | Ц<br>Арі     | pendix l  | L, equa  | tior     | 1 L9 oi  | r L9a), a   | lso s      | ee -    | Table 5     |          |             | -                  |          | I             |               |
| (67)m=   | 20.31      | 18.04      | 14.67           | <del></del>  | 11.1      | 8.3      | _        | 7.01     | 7.57        | 9.8        | _       | 13.21       | 16.7     | 7 19.5      | 8 2                | 20.87    |               | (67)          |
| Appliar  | nces gai   | ins (calc  | ulated          | in           | Append    | dix L, e | gua      | tion L   | 13 or L1    | 3a),       | also    | see Tal     | ole 5    |             |                    |          | I             |               |
| (68)m=   | 216.74     | 218.99     | 213.33          | _            | 201.26    | 186.03   | ·        | 71.71    | 162.15      | 159        | _       | 165.57      | 177.6    | 4 192.8     | 37 2               | 207.18   |               | (68)          |
|          |            | (calcula   | ted in          | <br>An       | pendix    | l equa   | <br>atio | n I 15   | or I 15a\   | L<br>) als | 0 SE    | ee Table    | 5        |             |                    |          | ı             |               |
| (69)m=   | 35.19      | 35.19      | 35.19           | ÷            | 35.19     | 35.19    | _        | 35.19    | 35.19       | 35.        | _       | 35.19       | 35.1     | 9 35.1      | 9 (                | 35.19    |               | (69)          |
|          | and far    | ns gains   | (Table          |              | <br>a)    |          |          |          |             | <u> </u>   |         |             |          |             | !_                 |          | ı             |               |
| (70)m=   | 3          | 3          | 3               | T            | 3         | 3        | Т        | 3        | 3           | 3          | 3       | 3           | 3        | 3           | Т                  | 3        | I             | (70)          |
|          | e a ev     | aporatio   | n (nec          | L<br>ati     | ve valu   | es) (Ta  | L<br>ble | 5)       |             | <u> </u>   |         |             |          |             |                    |          | ł             |               |
| (71)m=   | -97.53     | -97.53     | -97.53          | _            | -97.53    | -97.53   | _        | 97.53    | -97.53      | -97        | .53     | -97.53      | -97.5    | 3 -97.5     | 53 -               | 97.53    |               | (71)          |
|          |            | gains (T   | !               |              |           |          |          |          | ļ           | <u> </u>   |         |             |          | !           |                    |          | ł             |               |
| i        |            | 115.12     |                 | <del>-</del> | 104.7     | 100.8    | T        | 95.31    | 90.64       | 96.        | 62      | 98.74       | 104.9    | 06 1111.9   | 98 1               | 15.13    |               | (72)          |
|          |            | gains =    |                 |              |           |          |          |          |             |            |         | + (69)m + ( |          | _           |                    |          | ı             | , ,           |
| (73)m=   |            | 414.72     | 401.2           | 7 T          | 379.63    | 357.7    | T :      | 336.6    | 322.93      | 328        | _       | 340.1       | 361.9    | <u> </u>    | <del>`</del>       | 105.75   | l             | (73)          |
|          | ar gains   |            |                 |              |           |          | <u> </u> |          |             |            |         |             |          |             |                    |          |               |               |
|          |            |            | using so        | lar          | flux from | Table 6a | and      | d associ | iated equa  | tions      | to co   | nvert to th | e appli  | cable orie  | ntation            | ١.       |               |               |
| Orienta  | ation: A   | Access F   | actor           |              | Area      |          |          | Flu      | Х           |            |         | g_          |          | FF          |                    |          | Gains         |               |
|          | 7          | able 6d    |                 |              | m²        |          |          | Tal      | ole 6a      |            | Т       | able 6b     |          | Table 6     | SC .               |          | (W)           |               |
| South    | 0.9x       | 0.77       |                 | x            | 12.       | 15       | X        | 4        | 6.75        | x          |         | 0.63        | X        | 0.          | 7                  | _ =      | 173.6         | (78)          |
| South    | 0.9x       | 0.77       |                 | x            | 12.       | 15       | X        | 7        | 6.57        | x          |         | 0.63        | X        | 0.          | 7                  | ╡ =      | 284.31        | (78)          |
| South    | 0.9x       | 0.77       |                 | x            | 12.       | 15       | X        | 9        | 7.53        | X          |         | 0.63        | X        | 0.          | 7                  | ╡ -      | 362.16        | ]<br>(78)     |
| South    | 0.9x       | 0.77       |                 | x            | 12.       | 15       | X        | 1        | 10.23       | X          |         | 0.63        | X        | 0.          | 7                  | ╡ =      | 409.32        | (78)          |
| South    | 0.9x       | 0.77       | $\equiv$        | X            | 12.       |          | X        | _        | 14.87       | X          |         | 0.63        | ×        | 0.          |                    | ╡ =      | 426.54        | ]<br>(78)     |
| South    | 0.9x       | 0.77       | =               | X            | 12.       |          | x        | _        | 10.55       | )<br>  X   |         | 0.63        | x        | 0.          |                    | ╡ =      | 410.49        | ]<br>(78)     |
| South    | 0.9x       | 0.77       | ==              | X            | 12.       |          | x        | _        | 08.01       | )<br>  x   |         | 0.63        | x        | 0.          |                    | ╡ =      | 401.07        | ](78)         |
| South    | 0.9x       | 0.77       | =               | X            | 12.       |          | x        | _        | 04.89       | X          |         | 0.63        | X        | 0.          |                    | ╡ _      | 389.49        | (78)          |
|          |            | 0.11       |                 | •            | L         | . •      |          | <u> </u> |             | J          | Щ       | 0.00        | _ ^      |             | •                  |          | 300.40        | <b>」</b> ` ⁻′ |

| South   | 0.9x      | 0.77                   | X                | 12.         | 15                 | x             | 10     | 01.89            | x      |               | 0.63       | х        | 0.7         | =                      | 378.32  | (78) |
|---------|-----------|------------------------|------------------|-------------|--------------------|---------------|--------|------------------|--------|---------------|------------|----------|-------------|------------------------|---------|------|
| South   | 0.9x      | 0.77                   | x                | 12.         | 15                 | X             | 8      | 2.59             | x      |               | 0.63       | _ x _    | 0.7         |                        | 306.66  | (78) |
| South   | 0.9x      | 0.77                   | X                | 12.         | 15                 | x             | 5      | 5.42             | х      |               | 0.63       | x        | 0.7         | =                      | 205.77  | (78) |
| South   | 0.9x      | 0.77                   | x                | 12.         | 15                 | x             |        | 40.4             | x      |               | 0.63       | _ x _    | 0.7         | =                      | 150.01  | (78) |
|         | L         |                        |                  |             |                    |               |        |                  |        |               |            |          |             |                        |         | _    |
| Solar o | ains in   | watts, ca              | alculated        | for eac     | h month            |               |        |                  | (83)m  | า = Sเ        | um(74)m .  | (82)m    |             |                        |         |      |
| (83)m=  | 173.6     | 284.31                 | 362.16           | 409.32      | 426.54             | 1             | 10.49  | 401.07           | 389    | .49           | 378.32     | 306.66   | 205.77      | 150.01                 |         | (83) |
| Total g | jains – i | nternal a              | nd sola          | (84)m =     | = (73)m            | + (8          | 33)m   | , watts          | •      |               |            |          | !           | !                      |         |      |
| (84)m=  | 590.47    | 699.03                 | 763.43           | 788.96      | 784.24             | 74            | 47.09  | 724              | 718    | .43           | 718.42     | 668.6    | 592.77      | 555.76                 |         | (84) |
| 7 Me    | an inter  | nal temp               | perature         | (heating    | season             | )             |        |                  |        |               |            |          | ,           |                        |         |      |
|         |           | during h               |                  | `           |                    | <b>'</b>      | area f | from Tal         | ole 9  | Th            | 1 (°C)     |          |             |                        | 21      | (85) |
| -       |           | tor for g              | •                |             |                    | _             |        |                  | J.O 0, | ,             | . ( )      |          |             |                        | 21      |      |
| Otilloc | Jan       | Feb                    | Mar              | Apr         | May                | È             | Jun    | Jul              | Δ      | ug            | Sep        | Oct      | Nov         | Dec                    |         |      |
| (86)m=  | 0.99      | 0.98                   | 0.96             | 0.91        | 0.8                | $\vdash$      | 0.62   | 0.45             | 0.4    | <del>  </del> | 0.68       | 0.91     | 0.98        | 1                      |         | (86) |
|         |           | <u> </u>               | <u>l</u>         |             |                    |               |        |                  |        |               |            | 0.01     | 0.00        | <u> </u>               |         | ()   |
|         |           | l temper               |                  |             |                    | _             |        |                  |        |               |            |          | T           | I                      | Ī       | (07) |
| (87)m=  | 20.13     | 20.31                  | 20.53            | 20.76       | 20.91              | 2             | 0.99   | 21               | 2      | 1             | 20.97      | 20.79    | 20.42       | 20.1                   |         | (87) |
| Temp    | erature   | during h               | eating p         | eriods ir   | rest of            | dw            | elling | from Ta          | able 9 | 9, Tr         | n2 (°C)    |          |             | _                      | -       |      |
| (88)m=  | 20.1      | 20.1                   | 20.1             | 20.12       | 20.12              | 2             | 0.14   | 20.14            | 20.    | 14            | 20.13      | 20.12    | 20.12       | 20.11                  |         | (88) |
| Utilisa | ation fac | tor for g              | ains for         | rest of d   | welling,           | h2,           | m (se  | e Table          | 9a)    |               |            |          |             |                        |         |      |
| (89)m=  | 0.99      | 0.98                   | 0.95             | 0.88        | 0.75               | $\overline{}$ | 0.54   | 0.36             | 0.3    | 38            | 0.61       | 0.88     | 0.98        | 0.99                   |         | (89) |
| Mean    | interna   | l temper               | ature in         | the rest    | of dwell           | ina           | T2 (f  | allow ste        | ne 3   | to 7          | 7 in Tahl  | <u> </u> | !           | !                      | •       |      |
| (90)m=  | 18.94     | 19.21                  | 19.52            | 19.85       | 20.04              | Ť             | 0.13   | 20.14            | 20.    |               | 20.11      | 19.89    | 19.38       | 18.91                  |         | (90) |
| ()      |           |                        |                  |             |                    | _             |        |                  |        | !             |            |          | g area ÷ (4 |                        | 0.47    | (91) |
|         |           |                        |                  |             |                    |               |        |                  |        |               |            |          |             | •                      | 0.17    |      |
|         |           | l temper               |                  |             |                    | _             |        |                  |        |               |            | 00.04    | 1007        | 10.47                  | 1       | (92) |
| (92)m=  | 19.5      | 19.73                  | 19.99            | 20.27       | 20.45              |               | 0.53   | 20.54            | 20.    |               | 20.51      | 20.31    | 19.87       | 19.47                  |         | (92) |
| (93)m=  | 19.5      | nent to t              | ne mear<br>19.99 | 20.27       | 20.45              | _             | 0.53   | m Table<br>20.54 | 20.    |               | 20.51      | 20.31    | 19.87       | 19.47                  | ]       | (93) |
|         |           |                        |                  |             | 20.45              |               | 0.55   | 20.54            | 20.    | 34            | 20.51      | 20.31    | 19.67       | 19.47                  |         | (33) |
|         |           | iting requ<br>mean int |                  |             | ro obtair          | nod           | at eta | on 11 of         | Tabl   | o Oh          | so tha     | t Ti m-( | 76)m an     | d ro-calc              | sulato  |      |
|         |           | factor fo              |                  | •           |                    | icu           | at sit | эр ттог          | Tabi   | e st          | ), 30 tila |          | r Ojiii aii | u re-carc              | Julate  |      |
|         | Jan       | Feb                    | Mar              | Apr         | May                |               | Jun    | Jul              | A      | ug            | Sep        | Oct      | Nov         | Dec                    |         |      |
| Utilisa | ation fac | tor for g              | ains, hm         | ):          |                    | •             |        |                  |        |               |            |          | •           | •                      |         |      |
| (94)m=  | 0.99      | 0.98                   | 0.95             | 0.89        | 0.77               | (             | 0.57   | 0.4              | 0.4    | 12            | 0.64       | 0.89     | 0.98        | 0.99                   |         | (94) |
| Usefu   | ıl gains, | hmGm                   | , W = (9         | 4)m x (8    | 4)m                |               |        |                  | •      |               |            |          |             |                        |         |      |
| (95)m=  | 584.69    | 682.27                 | 723.81           | 699.59      | 603.21             | 42            | 29.55  | 289.77           | 303    | .27           | 461.36     | 594.06   | 578.92      | 551.69                 |         | (95) |
| Month   | nly aver  | age exte               | rnal tem         | perature    | from T             | abl           | e 8    |                  |        |               |            |          |             |                        | •       |      |
| (96)m=  | 4.3       | 4.9                    | 6.5              | 8.9         | 11.7               | Ľ             | 14.6   | 16.6             | 16.    | .4            | 14.1       | 10.6     | 7.1         | 4.2                    |         | (96) |
| Heat    | loss rate | e for mea              |                  | <del></del> | erature,           | Lm            | , W =  | =[(39)m          | x [(93 | 3)m-          | – (96)m    | ]        |             |                        | •       |      |
| (97)m=  | 1179.53   | 1146.01                | 1038.31          | 857.48      | 657.05             | 43            | 37.26  | 290.54           | 304    | .33           | 476.42     | 729.43   | 966.49      | 1165.17                |         | (97) |
| Space   |           | g require              | ement fo         | r each n    | nonth, k           | Wh            | /mont  | h = 0.02         | 24 x [ | (97)          | m – (95    | )m] x (4 | 1)m         |                        | 1       |      |
| (98)m=  | 442.56    | 311.63                 | 233.99           | 113.68      | 40.06              |               | 0      | 0                | 0      | )             | 0          | 100.71   | 279.05      | 456.43                 |         | _    |
|         |           |                        |                  |             |                    |               |        |                  |        | Total         | per year   | (kWh/yea | r) = Sum(9  | 8) <sub>15,912</sub> = | 1978.12 | (98) |
| Space   | e heatin  | g require              | ement in         | kWh/m²      | <sup>2</sup> /year |               |        |                  |        |               |            |          |             |                        | 25.13   | (99) |
|         |           | •                      |                  |             |                    |               |        |                  |        |               |            |          |             |                        | ı       | _    |

| 9a. Energy requirements – Individ                           | dual heating sy               | /stems ir | ncludina              | micro-C        | HP)                |                      |                                   |        |                        |       |
|---|-------------------------------|-----------|-----------------------|----------------|--------------------|----------------------|-----------------------------------|--------|------------------------|-------|
| Space heating:  | add Hodding O                 |           | rordanig              | 1111010 0      | , ,                |                      |                                   |        |                        | _     |
| Fraction of space heat from second                          | ondary/supple                 | mentary   | system                |                |                    |                      |                                   |        | 0                      | (201) |
| Fraction of space heat from main                            | n system(s)                   |           |                       | (202) = 1 -    | - (201) =          |                      |                                   |        | 1                      | (202) |
| Fraction of total heating from ma                           | ain system 1                  |           |                       | (204) = (20    | 02) <b>x</b> [1 –  | (203)] =             |                                   |        | 1                      | (204) |
| Efficiency of main space heating                            | system 1                      |           |                       |                |                    |                      |                                   |        | 93.5                   | (206) |
| Efficiency of secondary/supplem                             | entary heating                | g system  | , %                   |                |                    |                      |                                   |        | 0                      | (208) |
| Jan Feb Mar   | Apr May                       | Jun       | Jul                   | Aug            | Sep                | Oct                  | Nov                               | Dec    | kWh/ye                 | ar    |
| Space heating requirement (calc                             | <del> </del>                  | 1         | _                     |                | _                  | T                    | l                                 |        | 1                      |       |
|   | 13.68 40.06                   | 0         | 0                     | 0              | 0                  | 100.71               | 279.05                            | 456.43 |                        |       |
| $(211)m = \{[(98)m \times (204)] \} \times 100$             | <del>` ' ' </del>             | 0         | 0                     | 0              | 0                  | 407.74               | 200 45                            | 400.40 | 1                      | (211) |
| 473.33 333.3 250.26 12                                      | 21.58 42.85                   | 0         | 0                     | 0<br>Tota      | 0<br>L(kWh/vea     | 107.71<br>er) =Sum(2 | 298.45<br>211) <sub>15.1012</sub> | 488.16 | 2115.63                | (211) |
| Space heating fuel (secondary),                             | k\M/h/month                   |           |                       | 1014           | . (m               | ar) =0am(2           | - ' '/15,1012                     |        | 2115.65                | (211) |
| $= \{[(98) \text{m x } (201)] \} \text{ x } 100 \div (208)$ | KVVII/IIIOIIIII               |           |                       |                |                    |                      |                                   |        |                        |       |
| (215)m= 0 0 0   | 0 0                           | 0         | 0                     | 0              | 0                  | 0                    | 0                                 | 0      |                        |       |
|   |                               |           |                       | Tota           | l (kWh/yea         | ar) =Sum(2           | 215) <sub>15,1012</sub>           | F      | 0                      | (215) |
| Water heating   |                               |           |                       |                |                    |                      |                                   |        |                        |       |
| Output from water heater (calcula                           | ated above)<br>63.31   160.03 | 142.98    | 137.3                 | 150.68         | 150.42             | 169.35               | 179.08                            | 192.1  |                        |       |
| Efficiency of water heater                                  | 03.31 100.03                  | 142.30    | 107.0                 | 130.00         | 130.42             | 109.55               | 179.00                            | 192.1  | 79.8                   | (216) |
|   | 33.87 81.73                   | 79.8      | 79.8                  | 79.8           | 79.8               | 83.48                | 85.99                             | 87.04  | . 0.0                  | (217) |
| Fuel for water heating, kWh/mont                            | !<br>:h                       | ļ.        |                       |                |                    |                      |                                   |        |                        |       |
| $(219)m = (64)m \times 100 \div (217)m$                     |                               | 470.47    | 470.00                | 100.00         | 100.5              | 000 00               |                                   | 200.7  | Ī                      |       |
| (219)m= 226.49 200.9 213.14 19                              | 94.72 195.79                  | 179.17    | 172.06                | 188.82<br>Tota | 188.5<br>I = Sum(2 | 202.86<br>19a) =     | 208.26                            | 220.7  | 2391.4                 | (219) |
| Annual totals   |                               |           |                       |                | . ••••••           |                      | Wh/year                           | •      | kWh/yea                |       |
| Space heating fuel used, main sy                            | stem 1                        |           |                       |                |                    |                      |                                   |        | 2115.63                |       |
| Water heating fuel used                                     |                               |           |                       |                |                    |                      |                                   |        | 2391.4                 |       |
| Electricity for pumps, fans and ele                         | ectric keep-hot               | t         |                       |                |                    |                      |                                   |        |                        |       |
| central heating pump:                                       | '                             |           |                       |                |                    |                      |                                   | 30     |                        | (230c |
| boiler with a fan-assisted flue                             |                               |           |                       |                |                    |                      |                                   |        |                        | (230e |
|   | U- /                          |           |                       | oum.           | of (220a)          | (230g) =             |                                   | 45     |                        | _     |
| Total electricity for the above, kW                         | n/year                        |           |                       | Sum            | UI (230a).         | (230g) =             |                                   |        | 75                     | (231) |
| Electricity for lighting                                    |                               |           |                       |                |                    |                      |                                   |        | 358.61                 | (232) |
| 12a. CO2 emissions – Individual                             | I heating syste               | ems inclu | ıding mi              | cro-CHP        |                    |                      |                                   |        |                        |       |
|   |                               |           | <b>ergy</b><br>h/year |                |                    | Emiss<br>kg CO       | <b>ion fac</b><br>2/kWh           | tor    | Emissions<br>kg CO2/ye |       |
| Space heating (main system 1)                               |                               | (211      | ) x                   |                |                    | 0.2                  | 16                                | =      | 456.98                 | (261) |
| Space heating (secondary)                                   |                               | (215      | i) x                  |                |                    | 0.5                  |                                   | =      | 0                      | (263) |
| Water heating   |                               |           | ) x                   |                |                    | 0.2                  |                                   | =      | 516.54                 | (264) |
| Space and water heating                                     |                               |           |                       | + (263) + (    | 264) =             | <u> </u>             | 10                                |        |                        |       |
| opace and water nealing                                     |                               | (201      | , , (202)             | · (200) + (    |                    |                      |                                   |        | 973.52                 | (265) |

Electricity for pumps, fans and electric keep-hot (231) x 0.519 = 38.93 (267) Electricity for lighting (232) x 0.519 = 186.12 (268) Total CO2, kg/year sum of (265)...(271) = 1198.56 (272)

TER =

(273)

15.23

### **SAP 2012 Overheating Assessment**

Calculated by Stroma FSAP 2012 program, produced and printed on 07 October 2020

#### Property Details: Unit 7 - COPPETTS WOOD, London

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible:YesNumber of storeys:1Front of dwelling faces:North

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

**Night ventilation:** False

Blinds, curtains, shutters:

**Ventilation rate during hot weather (ach):**4 ( Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient: 276.4 (P1)

Transmission heat loss coefficient: 39

Summer heat loss coefficient: 315.38 (P2)

Overhangs:

Orientation: Ratio: Z\_overhangs:

South (Rear Windows) 0 1

Solar shading:

Orientation: Z blinds: Solar access: Overhangs: Z summer:

South (Rear Windows) 1 0.9 1 0.9 (P8)

Solar gains:

Orientation FF Area Flux Shading Gains  $g_{-}$ 0.9 486.99 South (Rear Windows) 0.9 x 12.15 112.21 0.63 0.7 **Total** 486.99 (P3/P4)

Internal gains:

June July **August** 479.28 470.05 Internal gains 461.75 984.08 948.74 (P5) Total summer gains 950.53 Summer gain/loss ratio 3.12 3.01 3.01 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Thermal mass temperature increment 1.3 1.3 1.3 (P7) Threshold temperature 20.42 22.21 22.11 Likelihood of high internal temperature Not significant Medium Medium

Assessment of likelihood of high internal temperature: Medium