

# **Regulations Compliance Report**

|                     | ent L1A, 2013 Editio<br>uary 2023 at 14:47::  |   | FSAP 2012 program, Version: 1.0.5.59 | )   |
|---------------------|---|---|--------------------------------------|-----|
| Project Informati   | on:   |   |                                      |     |
| Assessed By:        | Leighton Howe (S                              | TRO004042)  | Building Type: Flat                  |     |
| Dwelling Details:   |   |   |                                      |     |
| NEW DWELLING        | DESIGN STAGE                                  |   | Total Floor Area: 61m <sup>2</sup>   |     |
| Site Reference :    | AL-10   |   | Plot Reference: Flat 1               |     |
| Address :           | Flat 1, Manor Cou                             | ırt, 152 Abbey Road, LONDON,                            | NW6 4ST                              |     |
| Client Details:     |   |   |                                      |     |
| Name:               |   |   |                                      |     |
| Address :           |   |   |                                      |     |
| This report cove    | rs items included w                           | vithin the SAP calculations.                            |                                      |     |
| -                   | ete report of regula                          |   |                                      |     |
| 1a TER and DER      | र   |   |                                      |     |
|                     | ting system: Mains g                          | as  |                                      |     |
| Fuel factor: 1.00 ( | - /   |   |                                      |     |
| -                   | oxide Emission Rate                           | . ,   | 20.72 kg/m <sup>2</sup>              | OK  |
| 1b TFEE and DF      | Dioxide Emission Ra                           | te (DER)  | 15.84 kg/m²                          | ОК  |
|                     |   | =)  | 58.1 kWh/m²                          |     |
| -                   | ergy Efficiency (TFEE<br>nergy Efficiency (DF |   | 53.3 kWh/m²                          |     |
|                     | neigy Enclency (Di                            |   | 33.3 KWI/III-                        | ок  |
| 2 Fabric U-value    | es  |   |                                      |     |
| Element             |   | Average   | Highest                              |     |
| External            | wall  | 0.18 (max. 0.30)  | 0.18 (max. 0.70)                     | ОК  |
| Party wa            | II  | 0.00 (max. 0.20)  | -                                    | OK  |
| Floor               |   | (no floor)  |                                      |     |
| Roof                |   | 0.16 (max. 0.20)  | 0.16 (max. 0.35)                     | ОК  |
| Opening             | S   | 1.40 (max. 2.00)  | 1.40 (max. 3.30)                     | OK  |
| 2a Thermal brid     |   |   |                                      |     |
|                     |   | rom linear thermal transmittanc                         | es for each junction                 |     |
| 3 Air permeabili    |   |   |                                      |     |
|                     | bility at 50 pascals                          |   | 5.00 (design value)                  |     |
| Maximum             |   |   | 10.0                                 | OK  |
| 4 Heating efficie   | ency  |   |                                      |     |
| Main Heati          | ng system:                                    | Boiler systems with radiators<br>Data from manufacturer | or underfloor heating - mains gas    |     |
|                     |   | Combi boiler  |                                      |     |
|                     |   | Efficiency 88.0 % SEDBUK2                               | 009                                  |     |
|                     |   | Minimum 88.0 %  |                                      | ОК  |
| Secondary           | heating system:                               | None  |                                      |     |
|                     |   |   |                                      |     |
| 5 Cylinder insul    |   |   |                                      |     |
| Hot water S         | Storage:                                      | No cylinder   |                                      |     |
|                     |   |   |                                      | N/A |
|                     |   |   |                                      |     |



Therm Energy Ltd 01903 884357

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| Controls   |  |   |    |
|--|--|---|----|
| Space heating controls<br>Hot water controls:  | Programmer and at least<br>No cylinder thermostat<br>No cylinder | two room thermostats  | OK |
| Boiler interlock:  | Yes  |   | ОК |
| Low energy lights  |  |   |    |
| Percentage of fixed lights w<br>Minimum  | vith low-energy fittings   | 100.0%<br>75.0%   | ОК |
| Mechanical ventilation   |  |   |    |
| Not applicable   |  |   |    |
| Summertime temperature   |  |   |    |
| Overheating risk (South Ea   | st England):   | Slight  | OK |
| Overshading:<br>Windows facing: South<br>Windows facing: North<br>Windows facing: West |  | Average or unknown<br>12.18m <sup>2</sup><br>8.4m <sup>2</sup><br>4.2m <sup>2</sup> |    |
| Ventilation rate:<br>Blinds/curtains:  |  | 6.00<br>Dark-coloured curtain or roller<br>Closed 100% of daylight hours            |    |
| 0 Key features   |  |   |    |
| Party Walls U-value  |  | 0 W/m²K   |    |

Party Walls U-value Photovoltaic array

0 W/m<sup>2</sup>K

|  |                                |                     | User D              | etails:         |             |             |          |           |                        |      |
|--|--------------------------------|---------------------|---------------------|-----------------|-------------|-------------|----------|-----------|------------------------|------|
| Assessor Name:<br>Software Name:   | Leighton Howe<br>Stroma FSAP 2 | 012                 |                     | Strom<br>Softwa |             |             |          |           | 004042<br>n: 1.0.5.59  |      |
|  | Flat 1 Manar Ca                |                     |                     | Address:        |             |             |          |           |                        |      |
| Address :<br>1. Overall dwelling dimer   | Flat 1, Manor Cou              | un, 152 Ad          | оеу коа             | IU, LONL        | JON, NV     | VO 431      |          |           |                        |      |
|  |                                |                     | Area                | a(m²)           |             | Av. Hei     | iaht(m)  |           | Volume(m <sup>3</sup>  | )    |
| Ground floor   |                                |                     | -                   | · ·             | (1a) x      | <b></b>     | .4       | (2a) =    | 146.4                  | (3a) |
| Total floor area TFA = (1a   | a)+(1b)+(1c)+(1d)+(            | 1e)+(1r             | ı)                  | 61              | (4)         |             |          | J 1       |                        |      |
| Dwelling volume  |                                |                     |                     |                 | (3a)+(3b)   | +(3c)+(3d   | )+(3e)+  | .(3n) =   | 146.4                  | (5)  |
| 2. Ventilation rate:   |                                |                     |                     |                 |             |             |          |           |                        |      |
|  | main<br>heating                | secondar<br>heating | у                   | other           |             | total       |          |           | m <sup>3</sup> per hou | r    |
| Number of chimneys   |                                |                     | ] + [               | 0               | ] = [       | 0           | x 4      | 40 =      | 0                      | (6a) |
| Number of open flues   | 0 +                            | 0                   | <u> </u> + [        | 0               | -<br>  =    | 0           | x 2      | 20 =      | 0                      | (6b) |
| Number of intermittent far   | າຣ                             |                     |                     |                 |             | 3           | x 1      | 10 =      | 30                     | (7a) |
| Number of passive vents  |                                |                     |                     |                 | Г           | 0           | x 1      | 10 =      | 0                      | (7b) |
| Number of flueless gas fir   | es                             |                     |                     |                 |             | 0           | x 4      | 40 =      | 0                      | (7c) |
|  |                                |                     |                     |                 | L           |             |          |           |                        |      |
|  |                                |                     |                     |                 |             |             |          | Air ch    | anges per ho           | our  |
| Infiltration due to chimney  |                                |                     |                     |                 | ontinuo fr  | 30          |          | ÷ (5) =   | 0.2                    | (8)  |
| If a pressurisation test has be<br>Number of storeys in th   |                                | naea, proceed       | <i>u io (17),</i> c | ornerwise c     | onunue no   | 5m (9) to ( | 10)      |           | 0                      | (9)  |
| Additional infiltration  | e en en ig (e)                 |                     |                     |                 |             |             | [(9)-    | -1]x0.1 = | 0                      | (10) |
| Structural infiltration: 0.  | 25 for steel or timb           | er frame or         | 0.35 for            | masonr          | y constr    | uction      |          | -         | 0                      | (11) |
| if both types of wall are pro<br>deducting areas of openin   |                                | responding to       | the great           | er wall are     | a (after    |             |          |           |                        |      |
| If suspended wooden fl   |                                | ealed) or 0.        | 1 (seale            | d), else        | enter 0     |             |          |           | 0                      | (12) |
| If no draught lobby, ent   | er 0.05, else enter            | 0                   |                     |                 |             |             |          | ·         | 0                      | (13) |
| Percentage of windows  | and doors draught              | stripped            |                     |                 |             |             |          |           | 0                      | (14) |
| Window infiltration  |                                |                     |                     | 0.25 - [0.2     | x (14) ÷ 1  | = [00       |          |           | 0                      | (15) |
| Infiltration rate  |                                |                     |                     | (8) + (10)      | + (11) + (1 | 2) + (13) + | + (15) = |           | 0                      | (16) |
| Air permeability value, o  | q50, expressed in c            | ubic metre          | s per ho            | our per so      | quare m     | etre of e   | nvelope  | area      | 5                      | (17) |
| If based on air permeabili   |                                |                     |                     |                 |             |             |          |           | 0.45                   | (18) |
| Air permeability value applies   |                                | has been don        | e or a deg          | ree air pei     | rmeability  | is being us | sed      |           |                        | _    |
| Number of sides sheltered<br>Shelter factor  | d                              |                     |                     | (20) = 1 -      | 0 075 x (1  | 9)] =       |          |           | 1                      | (19) |
| Infiltration rate incorporati  | na shelter factor              |                     |                     | (21) = (18)     |             | 0/] –       |          |           | 0.92                   | (20) |
| Infiltration rate modified for   | -                              | ad                  |                     | () (,           | , (==)      |             |          |           | 0.42                   | (21) |
| rii  | Mar Apr Ma                     |                     | Jul                 | Aug             | Sep         | Oct         | Nov      | Dec       |                        |      |
| Monthly average wind spe   |                                | un our              | Uui                 | / lug           | Ocp         | 001         | Nov      | 000       |                        |      |
|  | 4.9 4.4 4.3                    | 3.8                 | 3.8                 | 3.7             | 4           | 4.3         | 4.5      | 4.7       |                        |      |
|  | II                             |                     |                     |                 |             |             |          | I         |                        |      |
| Wind Factor $(22a)m = (22a)m $ | ,<br>                          | 0.05                | 0.05                | 0.00            | <u>د</u>    | 1.00        | 4.40     | 1.40      |                        |      |
| (22a)m= 1.27 1.25 1  | 1.23 1.1 1.08                  | 0.95                | 0.95                | 0.92            | 1           | 1.08        | 1.12     | 1.18      |                        |      |

thermenergy

| Adjuste | ed infiltr | ation rat               | e (allowi                 | ng for sh   | elter an   | nd wind s      | peed) =    | = (21a) x     | (22a)m       |               |                  |                   | _     |               |   |
|---------|------------|-------------------------|---------------------------|-------------|------------|----------------|------------|---------------|--------------|---------------|------------------|-------------------|-------|---------------|---|
|         | 0.54       | 0.53                    | 0.52                      | 0.46        | 0.45       | 0.4            | 0.4        | 0.39          | 0.42         | 0.45          | 0.47             | 0.49              |       |               |   |
|         |            | ctive air<br>al ventila | -                         | rate for t  | he appli   | cable ca       | se         |               |              |               |                  |                   |       | (23a          |   |
|         |            |                         |                           | endix N. (2 | 3b) = (23; | a) x Fmv (e    | equation ( | N5)) , othe   | rwise (23b   | ) = (23a)     |                  |                   | 0     |               |   |
|         |            |                         | • • • •                   |             | , ,        | ,              |            | m Table 4h    |              | ) (200)       |                  |                   | 0     |               |   |
|         |            |                         | -                         | -           | -          |                |            | HR) (24a      |              | 2h)m + ('     | 23h) <b>x</b> [' | 1 – (23c)         |       | (23c)         | , |
| (24a)m= | 0          |                         |                           | 0           | 0          |                |            |               |              |               | 0                |                   | ]     | (24a)         | ) |
| · · ·   | balance    | d mech:                 | anical ve                 | ntilation   | without    | heat rec       | overv (    | MV) (24t      | 1 = (2)      | 2b)m + (2     | 23b)             |                   | 1     |               |   |
| (24b)m= | 0          | 0                       | 0                         | 0           | 0          | 0              | 0          | 0             | 0            | 0             | 0                | 0                 | 1     | (24b)         | ) |
|         | whole h    | ouse ex                 | tract ven                 | tilation o  | or positiv | /e input v     | /entilati  | on from (     | utside       |               |                  | <u> </u>          | 1     |               |   |
| ,       |            |                         |                           |             | •          | •              |            | lc) = (22     |              | .5 × (23b     | )                |                   |       |               |   |
| (24c)m= | 0          | 0                       | 0                         | 0           | 0          | 0              | 0          | 0             | 0            | 0             | 0                | 0                 | ]     | (24c)         | ) |
| ,       |            |                         |                           |             | •          | •              |            | on from       |              |               |                  |                   | -     |               |   |
| 1       | , ,        |                         | r í                       | `           | ,          | r È            | ,          | 0.5 + [(2     | r Ó          | <u> </u>      |                  |                   | 1     | (0.4.4        | N |
| (24d)m= | 0.64       | 0.64                    | 0.63                      | 0.61        | 0.6        | 0.58           | 0.58       | 0.58          | 0.59         | 0.6           | 0.61             | 0.62              | ]     | (24d)         | ) |
|         |            |                         | <u> </u>                  |             | , ,        | r i            | , <u>,</u> | 4d) in bo     | 1 <i>, ,</i> |               | 0.04             | 0.00              | 1     | (25)          |   |
| (25)m=  | 0.64       | 0.64                    | 0.63                      | 0.61        | 0.6        | 0.58           | 0.58       | 0.58          | 0.59         | 0.6           | 0.61             | 0.62              |       | (25)          |   |
| 3. Hea  | at losse   | s and he                | eat loss p                | paramete    | er:        |                |            |               |              |               |                  |                   |       |               |   |
| ELEN    | IENT       | Gros<br>area            |                           | Openin<br>m | -          | Net Ar<br>A ,n |            | U-val<br>W/m2 |              | A X U<br>(W/ł | (                | k-value<br>kJ/m²· |       | A X k<br>kJ/K |   |
| Doors   |            | aica                    | (111-)                    | 11          | _          | 1.89           | л-<br>Т х  |               | = [          | 2.646         | $\overline{}$    | KJ/III-•          | IX .  | (26)          |   |
| Windov  | ws Type    | <u>1</u>                |                           |             |            |                | =          | 1/[1/( 1.4 )+ |              |               | $\exists$        |                   |       | (20)          |   |
| Window  | • •        |                         |                           |             |            | 12.18          |            | 1/[1/( 1.4 )+ | l            | 16.15         | $\exists$        |                   |       | . ,           |   |
| Window  | • •        |                         |                           |             |            | 8.4            |            | 1/[1/( 1.4 )+ | L I          | 11.14         |                  |                   |       | (27)          |   |
|         |            |                         |                           |             |            | 4.2            |            |               |              | 5.57          | $\dashv$ ,       |                   |       | (27)          |   |
| Walls T |            | 66                      |                           | 24.78       |            | 41.22          |            | 0.18          |              | 7.42          | ╡╏               |                   | ╡ ┝   | (29)          |   |
| Walls T | ypez       | 16                      |                           | 1.89        |            | 14.11          |            | 0.18          | =            | 2.59          | ╡╞               |                   | ╡ ┝   | (29)          |   |
| Roof    |            | 66                      |                           | 0           |            | 66             | ×          | 0.16          | =            | 10.56         |                  |                   |       | (30)          |   |
|         |            | lements                 | , m²                      |             |            | 148            |            |               |              |               |                  |                   |       | (31)          |   |
| Party w |            |                         |                           |             |            | 16             | ×          | 0             | =            | 0             | Ļ                |                   | _     | (32)          |   |
| Interna |            |                         |                           |             |            | 71             |            |               |              |               | ļ                |                   |       | (32c)         | ) |
| Interna |            |                         |                           |             |            | 48             |            |               |              |               | Ĺ                |                   |       | (32d)         | ) |
| Interna | -          |                         |                           |             |            | 44             |            |               |              |               |                  |                   |       | (32e)         | ) |
|         |            |                         | ows, use e<br>sides of in |             |            |                | ated usin  | g formula 1   | /[(1/U-valu  | ıe)+0.04] a   | s given in       | paragrapl         | h 3.2 |               |   |
|         |            |                         | = S (A x                  |             | o ana par  |                |            | (26)(30       | ) + (32) =   |               |                  |                   | 56.0  | )7 (33)       |   |
|         |            | Cm = S(                 | •                         | ,           |            |                |            |               | ((28)        | (30) + (32    | 2) + (32a).      | (32e) =           | 5870  |               |   |
|         |            |                         | . ,                       | ? = Cm ÷    | - TFA) ir  | ר kJ/m²K       |            |               | Indica       | tive Value:   | Low              |                   | 100   |               |   |
| -       | -          |                         |                           |             | construct  | ion are not    | t known p  | recisely the  | e indicative | e values of   | TMP in Ta        | able 1f           |       |               |   |
|         |            |                         | tailed calcu              |             |            |                | /          |               |              |               |                  |                   |       | <b></b> .     |   |
| Inerma  | ai bridg   | es : S (L               | x y) calo                 | culated (   | using Ap   | pendix k       | `          |               |              |               |                  |                   | 6.8   | 8 (36)        |   |

if details of thermal bridging are not known  $(36) = 0.05 \times (31)$ 



| Total f                | abric he   | at loss                |             |             |             |             |            |   | (33) +                | (36) =      |   |         | 62.95   | (37) |
|------------------------|------------|------------------------|-------------|-------------|-------------|-------------|------------|---|-----------------------|-------------|---|---------|---------|------|
|                        |            | at loss ca             | alculated   | l monthly   | /           |             |            |   |                       |             | 25)m x (5)                              |         | 02.95   |      |
|                        | Jan        | Feb                    | Mar         | Apr         | May         | Jun         | Jul        | Aug   | Sep                   | Oct         | Nov                                     | Dec     |         |      |
| (38)m=                 | 31.11      | 30.84                  | 30.57       | 29.33       | 29.1        | 28.02       | 28.02      | 27.82   | 28.43                 | 29.1        | 29.57                                   | 30.06   |         | (38) |
| Heat tr                | ansfer o   | coefficier             | nt, W/K     |             |             |             |            |   | (39)m                 | = (37) + (3 | 38)m                                    |         |         |      |
| (39)m=                 | 94.06      | 93.79                  | 93.52       | 92.28       | 92.05       | 90.97       | 90.97      | 90.77   | 91.38                 | 92.05       | 92.52                                   | 93.01   |         |      |
|                        |            |                        |             |             |             |             |            |   |                       | •           | Sum(39)1.                               | 12 /12= | 92.28   | (39) |
| Heat Ic<br>(40)m=      | oss para   | 1.54                   | 1LP), W/    | m²K<br>1.51 | 1.51        | 1.49        | 1.49       | 1.49  | (40)m<br>1.5          | = (39)m ÷   | 1.52                                    | 1.52    |         |      |
| (40)11-                | 1.04       | 1.54                   | 1.00        | 1.51        | 1.51        | 1.43        | 1.43       | 1.43  |                       |             | Sum(40)1                                |         | 1.51    | (40) |
| Numbe                  | er of day  | /s in mor              | nth (Tab    | le 1a)      |             |             |            |   |                       |             |   |         |         | ``   |
|                        | Jan        | Feb                    | Mar         | Apr         | Мау         | 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 enei              | rgy requi   | rement:     |             |             |            |   |                       |             |   | kWh/ye  | ear:    |      |
| if TF                  |            |                        |             | [1 - exp    | (-0.0003    | 349 x (TF   | FA -13.9   | )2)] + 0.(  | 0013 x ( <sup>-</sup> | TFA -13.    |   | 01      |         | (42) |
| Annua<br><i>Reduce</i> | l averag   | je hot wa              | hot water   | usage by a  | 5% if the a | lwelling is | designed   | (25 x N)<br>to achieve  |                       | se target o |   | .93     |         | (43) |
|                        | Jan        | Feb                    | Mar         | Apr         | May         | Jun         | Jul        | Aug   | Sep                   | Oct         | Nov                                     | Dec     |         |      |
| Hot wate               | er usage i | n litres per           | day for ea  | ach month   | Vd,m = fa   | ctor from   | Table 1c x | (43)  |                       |             |   |         |         |      |
| (44)m=                 | 90.13      | 86.85                  | 83.57       | 80.29       | 77.02       | 73.74       | 73.74      | 77.02   | 80.29                 | 83.57       | 86.85                                   | 90.13   |         | _    |
| Enerav                 | content of | <sup>-</sup> hot water | used - cal  | culated mo  | onthlv = 4. | 190 x Vd.r  | m x nm x D | )<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>)<br>) |                       |             | <mark>m(44)</mark> 112 =<br>ables 1b. 1 |         | 983.18  | (44) |
| (45)m=                 | 133.65     | 116.89                 | 120.62      | 105.16      | 100.91      | 87.07       | 80.69      | 92.59   | 93.7                  | 109.19      | 119.19                                  | 129.44  |         |      |
| (,                     |            |                        |             |             |             |             |            |   |                       |             | m(45) <sub>112</sub> =                  |         | 1289.11 | (45) |
| lf instan              | taneous v  | vater heatii           | ng at point | of use (no  | hot water   | r storage), | enter 0 in | boxes (46   | ) to (61)             |             |   |         |         |      |
| (46)m=                 | 20.05      | 17.53                  | 18.09       | 15.77       | 15.14       | 13.06       | 12.1       | 13.89   | 14.05                 | 16.38       | 17.88                                   | 19.42   |         | (46) |
|                        | storage    |                        | includir    |             | alar or M   |             | storage    | within sa   |                       | ما          |   | 0       |         | (47) |
| -                      |            | neating a              |             |             |             |             | -          |   |                       | 301         |   | 0       |         | (47) |
| Otherv                 | •          | o stored               |             |             | •           |             |            | ombi boil   | ers) ente             | er '0' in ( | 47)                                     |         |         |      |
|                        | -          | turer's de             | eclared I   | oss facto   | or is kno   | wn (kWł     | n/day):    |   |                       |             |   | 0       |         | (48) |
| Tempe                  | erature f  | actor fro              | m Table     | 2b          |             |             |            |   |                       |             |   | 0       |         | (49) |
| •••                    |            | om water               | -           |             |             |             |            | (48) x (49)   | ) =                   |             |   | 0       |         | (50) |
|                        |            | turer's de<br>age loss |             | •           |             |             |            |   |                       |             |   | 0       |         | (51) |
|                        |            | neating s              |             |             | 0 2 (100    | 1,1110,00   | ×y)        |   |                       |             |   | 0       |         | (01) |
|                        |            | from Ta                |             |             |             |             |            |   |                       |             |   | 0       |         | (52) |
| Tempe                  | erature f  | actor fro              | m Table     | 2b          |             |             |            |   |                       |             |   | 0       |         | (53) |
|                        |            | m water                | -           | , kWh/ye    | ear         |             |            | (47) x (51)   | ) x (52) x (          | 53) =       |   | 0       |         | (54  |
| Enter                  | (50) or (  | (54) in (5             | 5)          |             |             |             |            |   |                       |             |   | 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)   | m = (56)m   | x [(50) – (   | H11)] ÷ (5   | 0), else (5   | 7)m = (56)   | m where (  | (H11) is fro   | m Append  | lix H         |                                      |
| (57)m=   | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0  | 0  | 0   |               | (57)                                 |
| Primar   | y circuit  | loss (ar   | nnual) fro   | om Table   | e 3   |   |  |   |  | -  |  | 0   |               | (58)                                 |
|  | •  |  |  |  | month (   | 59)m = (  | (58) ÷ 36  | 5 × (41)  | m  |  |  |   |               |                                      |
| (mo  | dified by  | factor f   | rom Tab  | le H5 if t   | here is s   | olar wat  | er heatir  | ng and a  | cylinde  | r thermo   | ostat)   |   |               |                                      |
| (59)m=   | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0  | 0  | 0   |               | (59)                                 |
| Combi  | loss ca  | lculated   | for each   | month (  | (61)m =   | (60) ÷ 36   | 65 × (41)  | m   |  |  |  |   |               |                                      |
| (61)m=   | 45.93  | 39.97  | 42.59  | 39.6   | 39.25   | 36.36   | 37.58  | 39.25   | 39.6   | 42.59  | 42.83  | 45.93   |               | (61)                                 |
| Total h  | eat requ   | uired for  | water he   | eating ca  | alculated   | for eacl  | h month  | (62)m =   | 0.85 × (   | (45)m +  | (46)m +  | (57)m +   | (59)m + (61)m |                                      |
| (62)m=   | 179.58   | 156.87   | 163.21   | 144.76   | 140.15  | 123.44  | 118.26   | 131.84  | 133.29   | 151.78   | 162.02   | 175.36  |               | (62)                                 |
|  |  |  |  |  |   |   |  |   |  | r contribut  | tion to wate   | er heating)   |               |                                      |
| (add a   | dditiona   | l lines if   | FGHRS  | and/or \   | WWHRS   | applies   | , see Ap   | pendix (  | G)   |  |  |   |               |                                      |
| (63)m=   | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0  | 0  | 0   |               | (63)                                 |
| Output   | from w   | ater hea   | ter  | -  |   |   | -  |   |  | -  |  |   |               |                                      |
| (64)m=   | 179.58   | 156.87   | 163.21   | 144.76   | 140.15  | 123.44  | 118.26   | 131.84  | 133.29   | 151.78   | 162.02   | 175.36  |               |                                      |
|  |  |  |  |  |   |   |  | Outp  | out from w   | ater heate   | r (annual)₁  | 12  | 1780.56       | (64)                                 |
| Heat g   | ains fro   | m water  | heating,   | kWh/m  | onth 0.2  | 5´[0.85   | × (45)m  | + (61)m   | n] + 0.8 x   | (46)m  | + (57)m  | + (59)m   | ]             |                                      |
| (65)m=   | 55.92  | 48.86  | 50.75  | 44.87  | 43.36   | 38.04   | 36.22  | 40.6  | 41.05  | 46.95  | 50.34  | 54.52   |               | (65)                                 |
| (00)   |  |  |  |  |   |   |  |   |  |  |  |   |               |                                      |
|  | lde (57)   | n in calo  | ulation (  | of (65)m   | only if c   | ylinder i   | s in the c   | dwelling  | or hot w   | ater is fi   | rom com  | munity h  | leating       |                                      |
| inclu  | . ,  |  | culation of Table 5  | . ,  | -   | ylinder is  | s in the c   | dwelling  | or hot w   | ater is fi   | rom com  | nunity h  | leating       |                                      |
| inclu<br>5. Int  | ternal ga  | ains (see  |  | 5 and 5a   | -   | ylinder is  | s in the c   | dwelling  | or hot w   | ater is fi   | rom com  | nunity h  | leating       |                                      |
| inclu<br>5. Int  | ternal ga  | ains (see  | e Table 5  | 5 and 5a   | -   | ylinder is<br>Jun   | s in the c<br>Jul  | dwelling<br>Aug   | or hot w<br>Sep  | ater is fi<br>Oct  | rom com  | munity h  | leating       |                                      |
| inclu<br>5. Int  | ernal ga   | ains (see<br>as (Table   | e Table 5<br>e 5), Wat   | 5 and 5a   | ):  |   | i  |   | Ī  | i  | 1  |   | leating       | (66)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains  | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula   | e Table 5<br>e 5), Wat<br>Mar<br>120.59<br>ted in Ap   | ts<br>Apr<br>120.59<br>Apr   | ):<br>May<br>120.59<br>L, equati  | Jun<br>120.59<br>ion L9 of  | Jul<br>120.59<br>r L9a), a   | Aug<br>120.59<br>Iso see  | Sep<br>120.59<br>Table 5   | Oct  | Nov  | Dec   | leating       | (66)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains  | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula   | e Table 5<br>e 5), Wat<br>Mar<br>120.59<br>ted in Ap   | ts<br>Apr<br>120.59<br>Apr   | ):<br>May<br>120.59   | Jun<br>120.59<br>ion L9 of  | Jul<br>120.59<br>r L9a), a   | Aug<br>120.59<br>Iso see  | Sep<br>120.59<br>Table 5   | Oct  | Nov  | Dec   | leating       | (66)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=   | olic gain<br>Jan<br>120.59<br>g gains<br>39.11   | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula<br>34.73  | 2 Table 5<br>2 5), Wat<br>Mar<br>120.59<br>ted in Ap<br>28.25  | and 5a<br>ts<br>Apr<br>120.59<br>opendix<br>21.39  | ):<br>May<br>120.59<br>L, equati  | Jun<br>120.59<br>ion L9 of<br>13.5  | Jul<br>120.59<br>r L9a), a<br>14.58  | Aug<br>120.59<br>Iso see<br>18.96   | Sep<br>120.59<br>Table 5<br>25.44  | Oct<br>120.59<br>32.3  | Nov<br>120.59  | Dec<br>120.59   | leating       |                                      |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=   | olic gain<br>Jan<br>120.59<br>g gains<br>39.11   | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula<br>34.73  | 2 Table 5<br>2 5), Wat<br>Mar<br>120.59<br>ted in Ap<br>28.25  | and 5a<br>ts<br>Apr<br>120.59<br>opendix<br>21.39  | ):<br>May<br>120.59<br>L, equati<br>15.99   | Jun<br>120.59<br>ion L9 of<br>13.5  | Jul<br>120.59<br>r L9a), a<br>14.58  | Aug<br>120.59<br>Iso see<br>18.96   | Sep<br>120.59<br>Table 5<br>25.44  | Oct<br>120.59<br>32.3  | Nov<br>120.59  | Dec<br>120.59   | leating       |                                      |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliat<br>(68)m=  | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88  | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6  | <ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>sulated in</li> <li>257.75</li> </ul>  | Apr           120.59           opendix           21.39           Appendix           243.17   | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, eq  | Jun<br>120.59<br>on L9 of<br>13.5<br>uation L<br>207.47   | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92  | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2   | Sep<br>120.59<br>Table 5<br>25.44<br>see Ta<br>200.05                                    | Oct<br>120.59<br>32.3<br>ble 5<br>214.63                                       | Nov<br>120.59<br>37.7  | Dec<br>120.59<br>40.19  | leating       | (67)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliat<br>(68)m=  | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88  | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6  | <ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>sulated in</li> <li>257.75</li> </ul>  | Apr           120.59           opendix           21.39           Appendix           243.17   | ):<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77   | Jun<br>120.59<br>on L9 of<br>13.5<br>uation L<br>207.47   | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92  | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2   | Sep<br>120.59<br>Table 5<br>25.44<br>see Ta<br>200.05                                    | Oct<br>120.59<br>32.3<br>ble 5<br>214.63                                       | Nov<br>120.59<br>37.7  | Dec<br>120.59<br>40.19  | leating       | (67)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Applia<br>(68)m=<br>Cookir<br>(69)m=   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>ng gains<br>49.07   | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07   | • Table 5<br>• 5), Wat<br>Mar<br>120.59<br>ted in Ap<br>28.25<br>•ulated in<br>257.75<br>ated in Ap  | Apr           120.59           opendix           21.39           Appendix           243.17           opendix           49.07   | ):<br>120.59<br>L, equati<br>15.99<br>dix L, equ<br>224.77<br>L, equat  | Jun<br>120.59<br>on L9 of<br>13.5<br>uation L<br>207.47<br>ion L15  | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)                                  | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se                                  | Sep<br>120.59<br>Table 5<br>25.44<br>see Ta<br>200.05<br>ee Table                        | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5                                  | Nov<br>120.59<br>37.7<br>233.03                                  | Dec<br>120.59<br>40.19<br>250.33                                  | leating       | (67)<br>(68)                         |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Applia<br>(68)m=<br>Cookir<br>(69)m=   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>ng gains<br>49.07   | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07   | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> </ul>  | Apr           120.59           opendix           21.39           Appendix           243.17           opendix           49.07   | ):<br>120.59<br>L, equati<br>15.99<br>dix L, equ<br>224.77<br>L, equat  | Jun<br>120.59<br>on L9 of<br>13.5<br>uation L<br>207.47<br>ion L15  | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)                                  | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se                                  | Sep<br>120.59<br>Table 5<br>25.44<br>2 see Ta<br>200.05<br>ee Table                      | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5                                  | Nov<br>120.59<br>37.7<br>233.03                                  | Dec<br>120.59<br>40.19<br>250.33                                  | leating       | (67)<br>(68)                         |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliat<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=                                       | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>ng gains<br>49.07<br>s and far<br>3   | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calcula<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3   | <ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in Ap</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> </ul>   | 5 and 5a<br>ts<br>Apr<br>120.59<br>ppendix<br>21.39<br>Appendix<br>243.17<br>ppendix<br>49.07<br>5a)<br>3  | ):<br>120.59<br>L, equati<br>15.99<br>dix L, equat<br>224.77<br>L, equat<br>49.07                                     | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07                                  | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07                         | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07                         | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>200.05<br>200.05<br>200.05<br>200.05      | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07                         | Nov<br>120.59<br>37.7<br>233.03<br>49.07                         | Dec<br>120.59<br>40.19<br>250.33<br>49.07                         | leating       | (67)<br>(68)<br>(69)                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliat<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=                                       | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>ng gains<br>49.07<br>s and far<br>3   | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calcula<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3   | <ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in Ap</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> </ul>   | 5 and 5a<br>ts<br>Apr<br>120.59<br>ppendix<br>21.39<br>Appendix<br>243.17<br>ppendix<br>49.07<br>5a)<br>3  | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equat<br>224.77<br>L, equat<br>49.07<br>3                         | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07                                  | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07                         | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07                         | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>200.05<br>200.05<br>200.05<br>200.05      | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07                         | Nov<br>120.59<br>37.7<br>233.03<br>49.07                         | Dec<br>120.59<br>40.19<br>250.33<br>49.07                         | leating       | (67)<br>(68)<br>(69)                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliau<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=<br>Losses<br>(71)m=                   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>g gains<br>49.07<br>s and fan<br>3<br>s e.g. ev<br>-80.39                     | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3<br>vaporatic   | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation of the second seco</li></ul> | and 5a         ts         Apr         120.59         opendix         21.39         a Append         243.17         opendix         49.07         5a)         3         tive valu                 | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77<br>L, equati<br>49.07<br>3<br>es) (Tab           | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07<br>3<br>le 5)                    | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07<br>3                    | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07                         | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>ee Table<br>49.07<br>3                    | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07<br>3                    | Nov<br>120.59<br>37.7<br>233.03<br>49.07<br>3                    | Dec<br>120.59<br>40.19<br>250.33<br>49.07<br>3                    | leating       | (67)<br>(68)<br>(69)<br>(70)         |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliau<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=<br>Losses<br>(71)m=                   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>g gains<br>49.07<br>s and fan<br>3<br>s e.g. ev<br>-80.39                     | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3<br>raporatic<br>-80.39                                 | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation of the second seco</li></ul> | and 5a         ts         Apr         120.59         opendix         21.39         a Append         243.17         opendix         49.07         5a)         3         tive valu                 | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77<br>L, equati<br>49.07<br>3<br>es) (Tab           | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07<br>3<br>le 5)                    | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07<br>3                    | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07                         | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>ee Table<br>49.07<br>3                    | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07<br>3                    | Nov<br>120.59<br>37.7<br>233.03<br>49.07<br>3                    | Dec<br>120.59<br>40.19<br>250.33<br>49.07<br>3                    | leating       | (67)<br>(68)<br>(69)<br>(70)         |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Applia<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=<br>Losses<br>(71)m=<br>Water<br>(72)m= | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>g gains<br>49.07<br>s and far<br>3<br>s e.g. ev<br>-80.39<br>heating<br>75.16 | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3<br>raporatic<br>-80.39<br>gains (T                     | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation - 80.39)</li> <li>able 5</li> <li>68.22</li> </ul>   | and 5a         ts         Apr         120.59         opendix         21.39         Appendix         243.17         oppendix         49.07         5a)         3         tive valu         -80.39 | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77<br>L, equati<br>49.07<br>3<br>es) (Tab<br>-80.39 | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07<br>3<br>le 5)<br>-80.39<br>52.84 | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07<br>3<br>-80.39<br>48.69 | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07<br>3<br>-80.39<br>54.57 | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>ee Table<br>49.07<br>3<br>-80.39<br>57.02 | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07<br>3<br>-80.39<br>63.11 | Nov<br>120.59<br>37.7<br>233.03<br>49.07<br>3<br>-80.39          | Dec<br>120.59<br>40.19<br>250.33<br>49.07<br>3<br>-80.39<br>73.28 | leating       | (67)<br>(68)<br>(69)<br>(70)<br>(71) |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Applia<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=<br>Losses<br>(71)m=<br>Water<br>(72)m= | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>g gains<br>49.07<br>s and far<br>3<br>s e.g. ev<br>-80.39<br>heating<br>75.16 | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3<br>raporatic<br>-80.39<br>gains (T<br>72.71<br>gains = | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation - 80.39)</li> <li>able 5</li> <li>68.22</li> </ul>   | and 5a         ts         Apr         120.59         opendix         21.39         Appendix         243.17         oppendix         49.07         5a)         3         tive valu         -80.39 | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77<br>L, equati<br>49.07<br>3<br>es) (Tab<br>-80.39 | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07<br>3<br>le 5)<br>-80.39<br>52.84 | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07<br>3<br>-80.39<br>48.69 | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07<br>3<br>-80.39<br>54.57 | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>ee Table<br>49.07<br>3<br>-80.39<br>57.02 | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07<br>3<br>-80.39<br>63.11 | Nov<br>120.59<br>37.7<br>233.03<br>49.07<br>3<br>-80.39<br>69.92 | Dec<br>120.59<br>40.19<br>250.33<br>49.07<br>3<br>-80.39<br>73.28 | leating       | (67)<br>(68)<br>(69)<br>(70)<br>(71) |

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



| Orientation | Access Facto<br>Table 6d | r | Area<br>m² |   | Flux<br>Table 6a |   | g_<br>Table 6b |   | FF<br>Table 6c |   | Gains<br>(W) |      |
|-------------|--------------------------|---|------------|---|------------------|---|----------------|---|----------------|---|--------------|------|
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 10.63            | × | 0.57           | x | 0.7            | = | 24.7         | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | x | 20.32            | x | 0.57           | x | 0.7            | = | 47.2         | (74) |
| North 0.9   | <b>x</b> 0.77            | x | 8.4        | × | 34.53            | × | 0.57           | x | 0.7            | = | 80.2         | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 55.46            | × | 0.57           | x | 0.7            | = | 128.82       | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 74.72            | × | 0.57           | x | 0.7            | = | 173.54       | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 79.99            | × | 0.57           | x | 0.7            | = | 185.78       | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 74.68            | x | 0.57           | x | 0.7            | = | 173.45       | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 59.25            | × | 0.57           | x | 0.7            | = | 137.61       | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 41.52            | × | 0.57           | x | 0.7            | = | 96.43        | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | x | 24.19            | x | 0.57           | x | 0.7            | = | 56.18        | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 13.12            | x | 0.57           | x | 0.7            | = | 30.47        | (74) |
| North 0.9   | 0.77 0.77                | x | 8.4        | × | 8.86             | × | 0.57           | x | 0.7            | = | 20.59        | (74) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 46.75            | x | 0.57           | x | 0.7            | = | 157.45       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 76.57            | x | 0.57           | x | 0.7            | = | 257.87       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 97.53            | x | 0.57           | x | 0.7            | = | 328.48       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 110.23           | x | 0.57           | x | 0.7            | = | 371.25       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 114.87           | × | 0.57           | x | 0.7            | = | 386.87       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 110.55           | x | 0.57           | x | 0.7            | = | 372.31       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | x | 108.01           | x | 0.57           | x | 0.7            | = | 363.77       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 104.89           | × | 0.57           | x | 0.7            | = | 353.27       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 101.89           | × | 0.57           | x | 0.7            | = | 343.14       | (78) |
| South 0.9   | 0.77 0.77                | x | 12.18      | × | 82.59            | x | 0.57           | x | 0.7            | = | 278.14       | (78) |
| South 0.9   | <b>0.77</b>              | x | 12.18      | × | 55.42            | x | 0.57           | x | 0.7            | = | 186.64       | (78) |
| South 0.9   | <b>0.77</b>              | x | 12.18      | × | 40.4             | × | 0.57           | x | 0.7            | = | 136.05       | (78) |
| West 0.9    | <b>0.77</b>              | x | 4.2        | × | 19.64            | × | 0.57           | x | 0.7            | = | 22.81        | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | × | 38.42            | × | 0.57           | x | 0.7            | = | 44.62        | (80) |
| West 0.9    | 0.77                     | x | 4.2        | × | 63.27            | x | 0.57           | x | 0.7            | = | 73.48        | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | × | 92.28            | × | 0.57           | x | 0.7            | = | 107.17       | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | x | 113.09           | × | 0.57           | x | 0.7            | = | 131.34       | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | × | 115.77           | x | 0.57           | x | 0.7            | = | 134.45       | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | × | 110.22           | x | 0.57           | x | 0.7            | = | 128          | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | x | 94.68            | x | 0.57           | x | 0.7            | = | 109.95       | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | × | 73.59            | × | 0.57           | x | 0.7            | = | 85.46        | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | × | 45.59            | × | 0.57           | x | 0.7            | = | 52.94        | (80) |
| West 0.9    | 0.77 0.77                | x | 4.2        | × | 24.49            | × | 0.57           | x | 0.7            | = | 28.44        | (80) |
| West 0.9    | 0.77                     | x | 4.2        | × | 16.15            | × | 0.57           | x | 0.7            | = | 18.76        | (80) |

| Solar g | ains in   | watts, ca | alculated | for eac              | h month   |         |         | (83)m = S | um(74)m. | (82)m  |        |        |      |
|---------|-----------|-----------|-----------|----------------------|-----------|---------|---------|-----------|----------|--------|--------|--------|------|
| (83)m=  | 204.96    | 349.69    | 482.16    | 607.25               | 691.75    | 692.54  | 665.22  | 600.83    | 525.03   | 387.26 | 245.54 | 175.4  | (83) |
| Total g | ains – ii | nternal a | ind solar | <sup>-</sup> (84)m = | = (73)m - | + (83)m | , watts |           |          |        |        |        |      |
| (84)m=  | 673.38    | 813.99    | 928.64    | 1026.38              | 1083.05   | 1058.61 | 1016.67 | 959.82    | 899.8    | 789.57 | 678.46 | 631.46 | (84) |





|   |   | perature  |  |  |   |                  |                    |                         |                       |             |            |         |                          |
|---|---|---|--|--|---|------------------|--------------------|-------------------------|-----------------------|-------------|------------|---------|--------------------------|
| Temperature   | •   | • •   |  |  | -   |                  | ole 9, Th          | 1 (°C)                  |                       |             |            | 21      | (85                      |
| Utilisation fac   |   |   | <u> </u>                                       |  | r`  | ,<br>            |                    |                         |                       |             |            |         |                          |
| Jan   | Feb   | Mar   | Apr  | May  | Jun   | Jul              | Aug                | Sep                     | Oct                   | Nov         | Dec        |         | (00                      |
| 6)m= 0.91   | 0.86  | 0.81  | 0.72   | 0.61   | 0.47  | 0.36             | 0.39               | 0.56                    | 0.75                  | 0.87        | 0.92       |         | (86                      |
| Mean interna  | l temper  | ature in  | living are                                     | ea T1 (fo  | ollow ste   | ps 3 to 7        | in Tabl            | e 9c)                   |                       |             |            |         |                          |
| 7)m= 18.52  | 18.91   | 19.43   | 20.01  | 20.48  | 20.79   | 20.92            | 20.9               | 20.67                   | 20.06                 | 19.19       | 18.45      |         | (87                      |
| Femperature   | during h  | eating p  | eriods ir                                      | n rest of  | dwelling  | from Ta          | ble 9, T           | h2 (°C)                 |                       |             |            |         |                          |
| <mark>8)m=</mark> 19.66   | 19.66   | 19.66   | 19.68  | 19.68  | 19.69   | 19.69            | 19.7               | 19.69                   | 19.68                 | 19.67       | 19.67      |         | (88)                     |
| Jtilisation fac   | tor for a   | ains for  | rest of d                                      | welling,   | h2.m (se  | e Table          | 9a)                |                         |                       | -           |            |         |                          |
| 9)m= 0.89   | 0.84  | 0.78  | 0.68   | 0.55   | 0.4   | 0.27             | 0.3                | 0.49                    | 0.71                  | 0.85        | 0.9        |         | (89                      |
| Mean interna  | l temper  | ature in  | the rest                                       | of dwelli  | na T2 (f  | nllow ste        | ns 3 to .          | 7 in Tahl               | e 9c)                 |             |            |         |                          |
| 0)m= 17.48  | 17.86   | 18.35   | 18.9   | 19.32  | 19.58   | 19.66            | 19.66              | 19.5                    | 18.96                 | 18.15       | 17.42      |         | (90                      |
| ,   |   |   |  |  |   |                  |                    | lf                      | LA = Livin            | g area ÷ (4 | 4) =       | 0.41    | (91                      |
| A   |   |   |  | - <b>1</b> | ()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>()<br>( |                  | . (4 . 61          |                         |                       |             | l          | -       |                          |
| Mean interna<br>2)m= 17.91  | 1 temper<br>18.29   | ature (10<br>18.79                                | 19.36 nr the wh                                | 01e dwe<br>19.79   | 1100 = 1  | LA × 11<br>20.18 | + (1 – TL<br>20.16 | A) × 12                 | 10.41                 | 18.57       | 17.04      |         | (92                      |
|   |   |   |  |  |   |                  |                    |                         | 19.41                 | 10.07       | 17.84      |         | (92                      |
| Apply adjustr<br>3)m= 17.91   | 18.29   | 18.79   | 19.36  | 19.79  | 20.08   | 20.18            | 20.16              | 19.98                   | 19.41                 | 18.57       | 17.84      |         | (93                      |
| B. Space hea  |   |   |  | 10.70  | 20.00   | 20.10            | 20.10              | 10.00                   | 10.41                 | 10.07       | 17.04      |         | (                        |
| Set Ti to the   | mean int  | ernal ter   | mperatur                                       |  | ed at st  | ep 11 of         | Table 9            | b, so tha               | t Ti,m=(              | 76)m an     | d re-calc  | ulate   |                          |
| he utilisation  | 1   | <u> </u>  |  |  |   |                  |                    |                         |                       | i           |            |         |                          |
| Jan   | Feb   | Mar   | Apr  | May  | Jun   | Jul              | Aug                | Sep                     | Oct                   | Nov         | Dec        |         |                          |
| Jtilisation fac   | 0.82  |   |  | 0.55   | 0.40  | 0.2              | 0.22               | 0.5                     | 0.7                   | 0.02        | 0.00       |         | (94                      |
| ,   |   | 0.76  | 0.67   | 0.55   | 0.42  | 0.3              | 0.33               | 0.5                     | 0.7                   | 0.83        | 0.88       |         | (94                      |
| Jseful gains,<br>5)m= 584.34  | 667.36  | , VV = (92<br>703.89                              | +)111 X (04<br>685.98                          | +)m<br>600.86  | 444.8   | 307.78           | 319.27             | 453.03                  | 552.18                | 559.81      | 555.77     |         | (95                      |
| Monthly aver  |   |   |  |  |   | 007.70           | 010.21             | 400.00                  | 002.10                | 000.01      | 000.11     |         | (00                      |
| 6)m= 4.3  | 4.9   | 6.5   | 8.9  | 11.7   | 14.6  | 16.6             | 16.4               | 14.1                    | 10.6                  | 7.1         | 4.2        |         | (96                      |
| feat loss rate  | e for mea   | an intern   | al tempe                                       | erature.   |   | [<br>=[(39)m ]   | L<br>x [(93)m      | <u> </u>                | 1                     |             |            |         |                          |
| 7)m= 1279.77  | r   | 1149.54   | · · · ·  | 745.04   | 498.08  | 325.43           | 341.73             | 537.19                  | 811.04                | 1061.55     | 1268.6     |         | (97                      |
| Space heatin  | g require   | ement fo  | r each n                                       | nonth, k   | Nh/mon <sup>-</sup>   | th = 0.02        | 24 x [(97          | )m – (95                | )m] x (4 <sup>-</sup> | 1)m         |            |         |                          |
| 8)m= 517.4  | 395.55  | 331.57  | 200.96   | 107.27   | 0   | 0                | 0                  | 0                       | 192.59                | 361.25      | 530.35     |         |                          |
|   |   |   |  |  |   |                  | Tota               | l per year              | (kWh/year             | ) = Sum(9   | 8)15,912 = | 2636.94 | (98                      |
|   |   | ement in  | kWh/m²   | /year  |   |                  |                    |                         |                       |             | י<br>      | 43.23   | (99                      |
| Space heatin  | a reauire   |   |  | ,  |   | ncluding         | mioro 6            | עם' –                   |                       |             |            |         | `                        |
| •   | • •   | to Joel   |  | ooting e   |   |                  | Thicro-C           |                         |                       |             |            |         |                          |
| a. Energy rec   | quiremer  | nts – Indi  | ividual h                                      | eating s   | ystems i  | 9                |                    |                         |                       |             |            |         |                          |
| a. Energy rec<br>Space heatin   | quiremer<br>ng:   |   |  |  |   | Ĭ                |                    |                         |                       |             |            | 0       | (20                      |
| a. Energy rec<br>Space heatin<br>Fraction of sp   | quiremer<br>ng:<br>bace hea                                       | at from se  | econdary                                       | y/supple   |   | system           | (202) = 1 ·        | - (201) =               |                       |             |            | 0       |                          |
| a. Energy rec<br>Space heatin<br>Fraction of sp<br>Fraction of sp                                   | quiremer<br>ng:<br>bace hea<br>bace hea                           | at from se<br>at from m                           | econdary<br>nain syst                          | y/supple<br>em(s)  |   | system           | (202) = 1          | – (201) =<br>02) × [1 – | (203)] =              |             |            | 1       | (20                      |
| Space heatin<br>a. Energy red<br>Space heatin<br>Fraction of sp<br>Fraction of sp<br>Fraction of to | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin             | at from se<br>at from m<br>ng from 1              | econdary<br>nain syst<br>main sys              | y/supple<br>em(s)<br>stem 1  |   | system           | (202) = 1          |                         | (203)] =              |             |            | 1       | (20<br>(20<br>(20<br>(20 |
| a. Energy rec<br>Space heatin<br>Fraction of sp<br>Fraction of sp                                   | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa | at from se<br>at from m<br>ng from i<br>ace heati | econdary<br>nain syst<br>main sys<br>ing syste | y/supple<br>em(s)<br>stem 1<br>em 1  | mentary   | system           | (202) = 1          |                         | (203)] =              |             |            | 1       | (20                      |

thermenergy



|  | Jan  | Feb  | Mar  | Apr  | May                   | Jun   | Jul   | Aug    | Sep             | Oct  | Nov  | Dec  | kWh/yea   | ır   |
|--|--|--|--|--|-----------------------|---|---|--------|-----------------|--|--|--|---|--|
| Space  | ī  |  | r · · ·  | 1  | d above)              |   |   |        |                 |  |  |  | 1   |  |
|  | 517.4  | 395.55   | 331.57   | 200.96   | 107.27                | 0   | 0   | 0      | 0               | 192.59   | 361.25   | 530.35   |   |  |
| (211)m   | = {[(98)<br>582.66   | )m x (20<br>445.44   | 4)] } x 1<br>373.38  | 00 ÷ (20<br>226.31   | ,<br>                 | 0   |   | 0      | 0               | 216.88   | 406.82   | 597.24   | 1   | (211)  |
|  | 582.66   | 445.44   | 373.38   | 226.31   | 120.8                 | 0   | 0   | -      | 0<br>I (kWh/yea |  | 406.82<br>211) <sub>15,1012</sub>                |  | 2969.53   | (211)  |
| Space  | e heating  | a fuel (s  | econdar  | y), kWh/   | month                 |   |   |        |                 |  | /15,1012   | 2  | 2909.00   | ]()  |
| •  |  |  | 00 ÷ (20   | • •  |                       |   |   |        |                 |  |  |  |   |  |
| (215)m=  | 0  | 0  | 0  | 0  | 0                     | 0   | 0   | 0      | 0               | 0  | 0  | 0  |   | -  |
|  |  |  |  |  |                       |   |   | Tota   | l (kWh/yea      | ar) =Sum(2   | 2 <b>15)</b> <sub>15,1012</sub>                  | <u>_</u>   | 0   | (215)  |
|  | heating  |  | tor (aala  | ulated a   |                       |   |   |        |                 |  |  |  |   |  |
| Output   | 179.58   | 156.87   | 163.21   | ulated a<br>144.76   | 140.15                | 123.44  | 118.26  | 131.84 | 133.29          | 151.78   | 162.02   | 175.36   |   |  |
| Efficier   | ncy of wa  | ater hea   | iter   |  |                       |   |   |        |                 |  | 1  |  | 79.5  | (216)  |
| (217)m=  | 86.2   | 85.95  | 85.5   | 84.65  | 83.28                 | 79.5  | 79.5  | 79.5   | 79.5            | 84.45  | 85.7   | 86.29  |   | (217)  |
|  |  | •  | kWh/m  |  |                       |   |   |        |                 |  |  |  |   |  |
| (219)m=  |  | 182.52   | ) <u>÷ (217)</u><br>190.89   | 171  | 168.29                | 155.27  | 148.76  | 165.83 | 167.66          | 179.74   | 189.07   | 203.22   |   |  |
|  |  |  |  |  |                       |   |   | Tota   | I = Sum(21      | 19a) <sub>112</sub> =                                      | 1  |  | 2130.57   | (219)  |
|  | l totals   |  |  |  |                       |   |   |        |                 | k  | Wh/year  |  | kWh/year  | -  |
| Space  | heating  | fuel use   | ed, main   | system   | 1                     |   |   |        |                 |  |  |  | 2969.53   | ]  |
| Water  | heating  | fuel use   | d  |  |                       |   |   |        |                 |  |  |  | 2130.57   |  |
|  | sity for n   | umns f   | ans and  | alactric   | koon ho               | •   |   |        |                 |  |  |  |   |  |
| Electric   | ny ioi p   | umpo, n  |  | electric   | keep-no               |   |   |        |                 |  |  |  |   |  |
|  | al heating   |  |  | electric   | keep-no               | L   |   |        |                 |  |  | 30   | ]   | (230c)   |
| centra   |  | g pump:  | :  | electric   | кеер-по               | L   |   |        |                 |  |  | 30<br>45   | ]   | (230c)<br>(230e)   |
| centra<br>boiler   | al heating<br>with a fa  | g pump:<br>an-assis  | ted flue   | <wh td="" yea<=""><td>·</td><td>ſ</td><td></td><td>sum</td><td>of (230a).</td><td>(230g) =</td><td></td><td></td><td>75</td><td></td></wh> | ·                     | ſ   |   | sum    | of (230a).      | (230g) =   |  |  | 75  |  |
| centra<br>boiler<br>Total e  | al heating<br>with a fa  | g pump:<br>an-assis<br>/ for the   | ted flue   |  | ·                     | ſ   |   | sum    | of (230a).      | (230g) =   | 1  |  | 75<br>276.25  | (230e)   |
| centra<br>boiler<br>Total e<br>Electric  | al heating<br>with a fa<br>lectricity  | g pump<br>an-assis<br>v for the<br>ghting  | :<br>sted flue<br>above, l   |  | ·                     | ſ   |   | sum    | of (230a).      | (230g) =   | :  |  |   | (230e)<br>(231)  |
| centra<br>boiler<br>Total e<br>Electric<br>Electric  | al heating<br>with a fa<br>lectricity<br>city for lig  | g pump<br>an-assis<br>v for the<br>ghting<br>erated b  | :<br>above, ł<br>y PVs   | ⟨Wh/yea  | ·                     |   | + (232).  |        | . ,             | (230g) =   | :  |  | 276.25  | (230e)<br>(231)<br>(232)   |
| centra<br>boiler<br>Total e<br>Electric<br>Electric<br>Total d   | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered   | g pump<br>an-assis<br>for the<br>ghting<br>erated b<br>energy  | :<br>above, l<br>above y PVs<br>for all u  | ⟨Wh/yea  | r<br>)(221)           |   | + (232).  |        | . ,             | (230g) =   |  |  | 276.25  | (230e)<br>(231)<br>(232)<br>(233)  |
| centra<br>boiler<br>Total e<br>Electric<br>Electric<br>Total d   | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered   | g pump<br>an-assis<br>for the<br>ghting<br>erated b<br>energy  | :<br>above, l<br>above y PVs<br>for all u  | ⟨Wh/yea<br>ses (211  | r<br>)(221)           | + (231)   |   |        | . ,             |  |  |  | 276.25<br>-760.49<br>4690.85  | (230e)<br>(231)<br>(232)<br>(233)  |
| centra<br>boiler<br>Total e<br>Electric<br>Electric<br>Total d   | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered   | g pump<br>an-assis<br>for the<br>ghting<br>erated b<br>energy  | :<br>above, l<br>above y PVs<br>for all u  | ⟨Wh/yea<br>ses (211  | r<br>)(221)           | + (231)<br><b>Fu</b>  |   |        | . ,             | (230g) =<br><b>Fuel P</b><br>(Table                        | rice   |  | 276.25  | (230e)<br>(231)<br>(232)<br>(233)  |
| centra<br>boiler<br>Total e<br>Electric<br>Total d<br>10a. F   | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered   | g pump:<br>an-assis<br>for the<br>ghting<br>erated by<br>energy<br>ts - indiv  | :<br>above, l<br>above y PVs<br>for all u  | ⟨Wh/yea<br>ses (211<br>eating sy   | r<br>)(221)           | + (231)<br><b>Fu</b><br>kW  | el  |        | . ,             | Fuel P   | P <b>rice</b><br>12)                             |  | 276.25<br>-760.49<br>4690.85<br>Fuel Cost   | (230e)<br>(231)<br>(232)<br>(233)  |
| centra<br>boiler<br>Total e<br>Electric<br>Total d<br>10a. F   | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered<br>Fuel cos<br>heating  | g pump<br>an-assis<br>y for the<br>ghting<br>erated by<br>energy<br>ts - indiv   | :<br>above, I<br>y PVs<br>for all u:<br><u>/idual he</u>   | ⟨Wh/yea<br>ses (211<br>eating sy   | r<br>)(221)           | + (231)<br><b>Fu</b><br>kW<br>(211  | <b>el</b><br>/h/year  |        | . ,             | Fuel P<br>(Table   | Price<br>12)                                     | 45   | 276.25<br>-760.49<br>4690.85<br><b>Fuel Cost</b><br>£/year  | (230e)<br>](231)<br>](232)<br>](233)<br>](338)   |
| centra<br>boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space   | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered<br>Fuel cos<br>heating  | g pump<br>an-assis<br>v for the<br>ghting<br>erated by<br>energy<br>ts - indiv<br>- main s   | :<br>above, I<br>y PVs<br>for all u:<br>vidual he<br>system 1  | ⟨Wh/yea<br>ses (211<br>eating sy   | r<br>)(221)           | + (231)<br><b>Fu</b><br>kW<br>(211<br>(213  | <b>el</b><br>/h/year<br>1) x                                  |        | . ,             | Fuel P<br>(Table   | Price<br>12)                                     | 45<br>× 0.01 =   | 276.25<br>-760.49<br>4690.85<br><b>Fuel Cost</b><br>£/year<br>103.34                                  | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](240)   |
| centra<br>boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space<br>Space  | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered<br>Fuel cos<br>heating<br>heating<br>heating                                      | g pump:<br>an-assis<br>v for the<br>ghting<br>erated by<br>energy<br>ts - indiv<br>- main s<br>- main s<br>- secon   | :<br>above, I<br>y PVs<br>for all u:<br>vidual he<br>system 1  | ⟨Wh/yea<br>ses (211<br>eating sy   | r<br>)(221)           | + (231)<br><b>Fu</b><br>kW<br>(211<br>(213  | <b>el</b><br>/h/year<br>1) x<br>3) x<br>5) x                  |        | . ,             | Fuel P<br>(Table   | Price<br>12)<br>18                               | 45<br>× 0.01 =<br>× 0.01 =   | 276.25<br>-760.49<br>4690.85<br><b>Fuel Cost</b><br>£/year<br>103.34<br>0                             | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](338)<br>](240)<br>](241)   |
| centra<br>boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space<br>Space<br>Water                                   | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered<br>fuel cost<br>heating<br>heating<br>heating                                     | g pump:<br>an-assis<br>y for the<br>ghting<br>erated by<br>energy<br>ts - indiv<br>- main s<br>- main s<br>- secon<br>cost (oth  | :<br>above, I<br>y PVs<br>for all u:<br>vidual he<br>system 2<br>dary  | kWh/yea<br>ses (211<br>eating sy   | r<br>)(221)           | + (231)<br>Fu<br>kW<br>(212<br>(213<br>(215   | el<br>/h/year<br>1) x<br>3) x<br>5) x<br>9)                   |        | . ,             | <b>Fuel P</b><br>(Table<br>3.4<br>(13.                     | Price<br>12)<br>18                               | 45<br>× 0.01 =<br>× 0.01 =<br>× 0.01 =   | 276.25<br>-760.49<br>4690.85<br><b>Fuel Cost</b><br>£/year<br>103.34<br>0<br>0                        | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](338)<br>](240)<br>](241)<br>](242)                               |
| centra<br>boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space<br>Space<br>Water<br>Pumps<br>(if off-p             | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered<br>Fuel cos<br>heating<br>heating<br>heating<br>a fans ar<br>eak tarif            | g pump:<br>an-assis<br>an-assis<br>for the<br>ghting<br>erated by<br>erated by<br>erated by<br>erated by<br>ts - indiv<br>ts - indiv<br>ts - indiv<br>ts - indiv<br>ts - secon<br>cost (oth<br>nd elect<br>ff, list ea | :<br>above, I<br>above, I<br>y PVs<br>for all u<br>vidual he<br>system 2<br>dary<br>her fuel)<br>ric keep                | <wh yea<br="">ses (211<br/>eating sy</wh>  | r<br>)(221)<br>stems: | + (231)<br>Fu<br>kW<br>(21)<br>(21)<br>(21)<br>(21)<br>(21)<br>(21)<br>(21)<br>(21) | el<br>/h/year<br>1) x<br>3) x<br>5) x<br>9)<br>1)<br>/ as app | (237b) | =               | Fuel P<br>(Table<br>3.4<br>13.<br>3.4<br>13.<br>7 fuel pri | Price<br>12)<br>18<br>19<br>19<br>19<br>19<br>19 | 45<br>45<br>× 0.01 =<br>× 0.01 =<br>× 0.01 =<br>× 0.01 =<br>× 0.01 =<br>× 0.01 = | 276.25<br>-760.49<br>4690.85<br>Fuel Cost<br>£/year<br>103.34<br>0<br>0<br>74.14<br>9.89<br>Table 12a | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](338)<br>](338)<br>](240)<br>](241)<br>](242)<br>](247)<br>](249) |
| centra<br>boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space<br>Space<br>Water I<br>Pumps<br>(if off-p<br>Energy | al heating<br>with a fa<br>lectricity<br>city for lig<br>city gene<br>elivered<br>fuel cos<br>heating<br>heating<br>heating<br>heating<br>a fans ar<br>eak tarif | g pump:<br>an-assis<br>v for the<br>ghting<br>erated by<br>erated by<br>erated by<br>erated by<br>ts - indiv<br>ts - indiv<br>- main s<br>- main s<br>- secon<br>cost (oth<br>nd elect<br>ff, list ea<br>ting          | :<br>above, l<br>above, l<br>y PVs<br>for all u<br>vidual he<br>system 2<br>dary<br>her fuel)<br>ric keep-<br>ach of (23 | <wh yea<br="">ses (211<br/>eating sy</wh>  | r<br>)(221)<br>stems: | + (231)<br>Fu<br>kW<br>(21)<br>(213<br>(215<br>(215)<br>(23)                        | el<br>/h/year<br>1) x<br>3) x<br>5) x<br>9)<br>1)<br>/ as app | (237b) | =               | Fuel P<br>(Table<br>3.4<br>13.<br>3.4<br>13.               | Price<br>12)<br>18<br>19<br>19<br>19<br>19<br>19 | 45<br>x 0.01 =<br>x 0.01 =<br>x 0.01 =<br>x 0.01 =<br>x 0.01 =<br>x 0.01 =       | 276.25<br>-760.49<br>4690.85<br>Fuel Cost<br>£/year<br>103.34<br>0<br>0<br>74.14<br>9.89              | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](338)<br>](240)<br>](241)<br>](242)<br>](247)                     |



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|   | one of (233) to (235) x)        | 13.19 × 0.01 =                | -100.31                        | (252) |
|---|---------------------------------|-------------------------------|--------------------------------|-------|
| Appendix Q items: repeat lines (253) and (254) as | needed                          |                               |                                | -     |
| Total energy cost(245)(247)                       | ) + (250)(254) =                |                               | 243.5                          | (255) |
| 11a. SAP rating - individual heating systems      |                                 |                               |                                |       |
| Energy cost deflator (Table 12)                   |                                 |                               | 0.42                           | (256) |
| Energy cost factor (ECF) [(255) x (25)            | 6)] ÷ [(4) + 45.0] =            |                               | 0.96                           | (257) |
| SAP rating (Section 12)                           |                                 |                               | 86.54                          | (258) |
| 12a. CO2 emissions – Individual heating systems   | including micro-CHP             |                               |                                |       |
|   | <b>Energy</b><br>kWh/year       | Emission factor<br>kg CO2/kWh | <b>Emissions</b><br>kg CO2/yea | ır    |
| Space heating (main system 1)                     | (211) x                         | 0.216 =                       | 641.42                         | (261) |
| Space heating (secondary)                         | (215) x                         | 0.519 =                       | 0                              | (263) |
| Water heating                                     | (219) x                         | 0.216 =                       | 460.2                          | (264) |
| Space and water heating                           | (261) + (262) + (263) + (264) = | =                             | 1101.62                        | (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x                         | 0.519 =                       | 38.93                          | (267) |
| Electricity for lighting                          | (232) x                         | 0.519 =                       | 143.37                         | (268) |
| Energy saving/generation technologies             |                                 |                               |                                | _     |
| Item 1  |                                 | 0.519 =                       | -394.7                         | (269) |
| Total CO2, kg/year                                | SL                              | ım of (265)(271) =            | 889.22                         | (272) |
| CO2 emissions per m <sup>2</sup>                  | (2                              | 72) ÷ (4) =                   | 14.58                          | (273) |
| EI rating (section 14)                            |                                 |                               | 89                             | (274) |
| 13a. Primary Energy                               |                                 |                               |                                |       |
|   | <b>Energy</b><br>kWh/year       | <b>Primary</b><br>factor      | <b>P. Energy</b><br>kWh/year   |       |
| Space heating (main system 1)                     | (211) x                         | 1.22 =                        | 3622.82                        | (261) |
| Space heating (secondary)                         | (215) x                         | 3.07 =                        | 0                              | (263) |
| Energy for water heating                          | (219) x                         | 1.22 =                        | 2599.29                        | (264) |
| Space and water heating                           | (261) + (262) + (263) + (264) = | =                             | 6222.11                        | (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x                         | 3.07 =                        | 230.25                         | (267) |
| Electricity for lighting                          | (232) x                         | 0 =                           | 848.09                         | (268) |
| Energy saving/generation technologies<br>Item 1   |                                 | 3.07 =                        | -2334.71                       | (269) |
| 'Total Primary Energy                             | su                              | um of (265)(271) =            | 4965.75                        | (272) |
| Primary energy kWh/m²/year                        | (2                              | 72) ÷ (4) =                   | 81.41                          | (273) |



# **Regulations Compliance Report**

| Printed on 24 Januar                          |                      | •   | na FSAP 2012 program, Version: 1            | .0.5.59 |
|---|----------------------|---|---|---------|
| Project Information:<br>Assessed By: L        | eighton Howe (S1     | BO004042)   | Building Type: Flat                         |         |
| -   | eignion nowe (Si     | R0004042)   | Building Type. Flat                         |         |
| Dwelling Details:                             |                      |   |   |         |
| NEW DWELLING DE                               |                      |   | Total Floor Area: 40m <sup>2</sup>          |         |
| Site Reference : A                            | AL-10                |   | Plot Reference: Flat 2                      | 2       |
| Address : F                                   | lat 2, Manor Cour    | t, 152 Abbey Road, LONDO  | N, NW6 4ST                                  |         |
| Client Details:                               |                      |   |   |         |
| Name:<br>Address :                            |                      |   |   |         |
| This report covers if<br>It is not a complete |                      | thin the SAP calculations.  |   |         |
| 1a TER and DER                                | report of regulati   | ons compliance.   |   |         |
| Fuel for main heating                         | system: Mains da     | IS  |   |         |
| Fuel factor: 1.00 (mai                        |                      |   |   |         |
| Target Carbon Dioxid                          | • •                  | TER)  | 24.68 kg/m <sup>2</sup>                     |         |
| Dwelling Carbon Diox                          | dide Emission Rate   | e (DER)   | 17.77 kg/m <sup>2</sup>                     | ОК      |
| 1b TFEE and DFEE                              |                      |   |   |         |
| Target Fabric Energy                          | Efficiency (TFEE)    | 1   | 66.2 kWh/m <sup>2</sup>                     |         |
| Dwelling Fabric Energ                         | gy Efficiency (DFE   | E)  | 60.5 kWh/m <sup>2</sup>                     |         |
|   |                      |   |   | OK      |
| 2 Fabric U-values                             |                      |   |   |         |
| Element                                       |                      | Average   | Highest                                     |         |
| External wal                                  | I                    | 0.18 (max. 0.30)  | 0.18 (max. 0.70)                            | OK      |
| Party wall                                    |                      | 0.00 (max. 0.20)  | -   | OK      |
| Floor   |                      | (no floor)  | 0.40 (                                      | 01/     |
| Roof  |                      | 0.16 (max. 0.20)  | 0.16 (max. 0.35)                            | OK      |
| Openings                                      |                      | 1.40 (max. 2.00)  | 1.40 (max. 3.30)                            | OK      |
| 2a Thermal bridgin                            |                      |   |   |         |
| 3 Air permeability                            | lging calculated fro | om linear thermal transmittar   | ices for each junction                      |         |
|   | y at 50 pascals      |   | 5.00 (design value)                         |         |
| Maximum                                       | y at 50 pascals      |   | 10.0  | ОК      |
|   |                      |   | 1010  |         |
| 4 Heating efficiency                          |                      |   |   |         |
| Main Heating s                                | system:              | Boiler systems with radiato<br>Data from manufacturer<br>Combi boiler<br>Efficiency 88.0 % SEDBUK<br>Minimum 88.0 % | rs or underfloor heating - mains ga<br>2009 | s<br>OK |
| Secondary hea                                 | ating system:        | None  |   |         |
| 5 Cylinder insulation                         | on                   |   |   |         |
| Hot water Stor                                | age:                 | No cylinder   |   | N/A     |



Therm Energy Ltd 01903 884357

# **Regulations Compliance Report**

| 6 Controls   |  |  |    |
|--|--|--|----|
| Space heating controls<br>Hot water controls:  | Programmer and at leas<br>No cylinder thermostat | t two room thermostats   | OK |
| Boiler interlock:  | No cylinder<br>Yes                               |  | ок |
| 7 Low energy lights  |  |  |    |
| Percentage of fixed lights wit<br>Minimum  | h low-energy fittings                            | 100.0%<br>75.0%  | ОК |
| 8 Mechanical ventilation   |  |  |    |
| Not applicable   |  |  |    |
| 9 Summertime temperature   |  |  |    |
| Overheating risk (South Eas<br>Based on:<br>Overshading:<br>Windows facing: South<br>Windows facing: West<br>Ventilation rate:<br>Blinds/curtains: | t England):                                      | Medium<br>Average or unknown<br>12.6m <sup>2</sup><br>7.14m <sup>2</sup><br>6.00<br>Dark-coloured curtain or roller blind<br>Closed 100% of daylight hours | OK |
| 10 Key features<br>Party Walls U-value<br>Photovoltaic array   |  | 0 W/m²K  |    |

|  |                                   | <u>User</u>       | Details:                      |            |                                       |          |          |                         |                |
|--|-----------------------------------|-------------------|-------------------------------|------------|---------------------------------------|----------|----------|-------------------------|----------------|
| Assessor Name:<br>Software Name:                 | Leighton Howe<br>Stroma FSAP 2012 |                   | Stroma<br>Softwa              | re Ver     |                                       |          |          | 004042<br>n: 1.0.5.59   |                |
| Address :  | Flat 2, Manor Court,              |                   | y Address:<br>oad, LOND       |            | V6 4ST                                |          |          |                         |                |
| 1. Overall dwelling dime                         | ensions:                          |                   |                               |            |                                       |          |          |                         |                |
|  |                                   | A                 | rea(m²)                       |            | Av. Hei                               | ght(m)   |          | Volume(m <sup>3</sup> ) | _              |
| Ground floor                                     |                                   |                   | 40                            | (1a) x     | 2                                     | .4       | (2a) =   | 96                      | (3a)           |
| Total floor area TFA = (1                        | a)+(1b)+(1c)+(1d)+(1e)            | +(1n)             | 40                            | (4)        |                                       |          |          |                         |                |
| Dwelling volume                                  |                                   |                   |                               | (3a)+(3b)  | )+(3c)+(3d)                           | )+(3e)+  | (3n) =   | 96                      | (5)            |
| 2. Ventilation rate:                             |                                   |                   |                               |            |                                       |          |          |                         |                |
| Number of chimneys                               |                                   | condary<br>eating | other<br>0                    | ] = [      | total                                 | x 4      | 0 =      | m <sup>3</sup> per hour | (6a)           |
| Number of open flues                             |                                   | 0 +               | 0                             | 」<br>】 = 厂 | 0                                     | x 2      | 20 =     | 0                       | ](6b)          |
| Number of intermittent fa                        |                                   | Ū                 | 0                             |            | -                                     | x 1      | 0 =      |                         | ](02)<br>](7a) |
|  |                                   |                   |                               | Ļ          | 2                                     |          | 0 =      | 20                      |                |
| Number of passive vents                          |                                   |                   |                               | Ļ          | 0                                     |          |          | 0                       | (7b)           |
| Number of flueless gas f                         | Ires                              |                   |                               |            | 0                                     | X 4      | -0 =     | 0                       | (7c)           |
|  |                                   |                   |                               |            |                                       |          | Air ch   | anges per ho            | ur             |
|  | been carried out or is intended   |                   |                               | ontinue fr | 20<br>om (9) to (                     |          | - (5) =  | 0.21                    | (8)            |
| Number of storeys in the Additional infiltration | ne aweiling (ns)                  |                   |                               |            |                                       | [(9)-    | 1]x0.1 = | 0                       | (9)<br>(10)    |
|  | .25 for steel or timber fr        | ame or 0.35       | for masonry                   | / constr   | uction                                | [(0)     | 110.1 -  | 0                       | ](10)<br>](11) |
|  | resent, use the value corresp     |                   | •                             |            |                                       |          |          |                         |                |
| •  | floor, enter 0.2 (unseale         | ed) or 0.1 (sea   | aled), else e                 | enter 0    |                                       |          |          | 0                       | (12)           |
| If no draught lobby, en                          |                                   |                   |                               |            |                                       |          |          | 0                       | (13)           |
| Vercentage of window<br>Window infiltration      | s and doors draught str           | ipped             | 0.25 - [0.2                   | x (14) ∸ 1 | 001 -                                 |          |          | 0                       |                |
| Infiltration rate                                |                                   |                   | (8) + (10) +                  |            | -                                     | · (15) = |          | 0                       | (15)<br>(16)   |
|  | q50, expressed in cubi            | c metres per      |                               |            | , , , , , , , , , , , , , , , , , , , |          | area     | 5                       | (17)           |
| If based on air permeabi                         | lity value, then $(18) = [(17)]$  | ) ÷ 20]+(8), othe | rwise (18) = (1               | 6)         |                                       |          |          | 0.46                    | (18)           |
|  | es if a pressurisation test has   | been done or a d  | legree air per                | meability  | is being us                           | ed       |          |                         | -              |
| Number of sides sheltere<br>Shelter factor       | эd                                |                   | (20) = 1 - [0                 | ) 075 v (1 | (Q)] —                                |          |          | 1                       | (19)           |
| Infiltration rate incorpora                      | ting shelter factor               |                   | (20) = 1 - [0]<br>(21) = (18) |            | [0]] =                                |          |          | 0.92                    | (20)           |
| Infiltration rate modified f                     | •                                 |                   | (21) - (10)                   | x (20) -   |                                       |          |          | 0.42                    | (21)           |
| Jan Feb  | Mar Apr May                       | Jun Jul           | Aug                           | Sep        | Oct                                   | Nov      | Dec      |                         |                |
| Monthly average wind sp                          |                                   |                   |                               |            |                                       |          |          |                         |                |
| (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 $\div$ 4                   | I                 | _1 _1                         |            | ıl                                    |          |          | I                       |                |
| (22a)m= 1.27 1.25                                | 1.23 1.1 1.08                     | 0.95 0.95         | 0.92                          | 1          | 1.08                                  | 1.12     | 1.18     |                         |                |
|  |                                   | I                 |                               |            |                                       |          |          | I                       |                |



| Adjust   | ed infiltr | ation rat                       | e (allowi                  | ng for sh                    | nelter an   | d wind s    | peed) =    | : (21a) x    | (22a)m       |                |                       |                     | -                  |         |
|----------|------------|---------------------------------|----------------------------|------------------------------|-------------|-------------|------------|--------------|--------------|----------------|-----------------------|---------------------|--------------------|---------|
|          | 0.54       | 0.53                            | 0.52                       | 0.47                         | 0.46        | 0.4         | 0.4        | 0.39         | 0.42         | 0.46           | 0.48                  | 0.5                 |                    |         |
|          |            | c <i>tive air</i><br>al ventila | •                          | rate for t                   | he appli    | cable ca    | se         |              |              |                |                       |                     |                    | (23a)   |
|          |            |                                 |                            | endix N, (2                  | 3b) = (23a  | i) x Fmv (e | equation ( | N5)) othe    | rwise (23h   | (23a) = (23a)  |                       |                     | 0                  | (23a)   |
|          |            |                                 | • • • •                    | iency in %                   | , ,         |             |            |              |              | (200)          |                       |                     | 0                  |         |
|          |            |                                 | -                          | -                            | -           |             |            |              |              | 2b)m + (:      | 23h) v [ <sup>,</sup> | 1 _ (23c)           | $0$ $\div 1001$    | (23c)   |
| (24a)m=  |            |                                 |                            | 0                            | 0           | 0           |            |              | 0            |                |                       | $\frac{1-(230)}{0}$ | ]<br>]             | (24a)   |
|          |            |                                 |                            | _                            | _           | -           |            | -            |              | 1<br>2b)m + (2 |                       | , ,                 | J                  | ~ /     |
| (24b)m=  |            |                                 |                            | 0                            | 0           |             |            |              |              |                | 0                     | 0                   | 1                  | (24b)   |
|          |            |                                 |                            | ntilation c                  |             |             |            |              |              |                |                       |                     | J                  | × ,     |
|          |            |                                 |                            |                              | •           | •           |            |              |              | .5 × (23b      | ))                    |                     |                    |         |
| (24c)m=  | <u> </u>   | 0                               | 0                          | 0                            | 0           | 0           | 0          | 0            | 0            | 0              | 0                     | 0                   | ]                  | (24c)   |
| d) If    | natural    | ventilatio                      | on or wh                   | ole hous                     | e positiv   | /e input v  | ventilati  | on from      | loft         |                |                       |                     | 1                  |         |
| i        | if (22b)r  | n = 1, th                       | en (24d)                   | m = (22k                     | o)m othe    | rwise (2    | 4d)m =     | 0.5 + [(2    | 2b)m² x      | 0.5]           |                       | •                   | -                  |         |
| (24d)m=  | 0.65       | 0.64                            | 0.63                       | 0.61                         | 0.6         | 0.58        | 0.58       | 0.58         | 0.59         | 0.6            | 0.61                  | 0.62                |                    | (24d)   |
| Effe     | ctive air  | change                          | rate - er                  | nter (24a                    | ) or (24b   | o) or (24   | c) or (24  | d) in bo     | x (25)       | •              |                       |                     | -                  |         |
| (25)m=   | 0.65       | 0.64                            | 0.63                       | 0.61                         | 0.6         | 0.58        | 0.58       | 0.58         | 0.59         | 0.6            | 0.61                  | 0.62                |                    | (25)    |
| 3. He    | at losse   | s and he                        | eat loss i                 | paramete                     | er:         |             |            |              |              |                |                       |                     |                    |         |
| ELEN     | IENT       | Gros                            | SS                         | Openin                       | gs          | Net Ar      | ea         | U-val        | ue           | AXU            |                       | k-valu              | е                  | A X k   |
|          |            | area                            | (m²)                       | m                            | 2           | A ,r        | n²         | W/m2         | 2K           | (W/I           | K)                    | kJ/m²∙              | K                  | kJ/K    |
| Doors    |            |                                 |                            |                              |             | 1.89        | x          | 1.4          | =            | 2.646          |                       |                     |                    | (26)    |
| Windo    | ws Type    | e 1                             |                            |                              |             | 12.6        | x1         | /[1/( 1.4 )+ | 0.04] =      | 16.7           |                       |                     |                    | (27)    |
| Windo    | ws Type    | 2                               |                            |                              |             | 7.14        | x1         | /[1/( 1.4 )+ | 0.04] =      | 9.47           |                       |                     |                    | (27)    |
| Walls 7  | Type1      | 51                              |                            | 19.74                        | 4           | 31.26       | 5 X        | 0.18         | =            | 5.63           |                       |                     |                    | (29)    |
| Walls 7  | Туре2      | 12                              | )<br>-                     | 1.89                         |             | 10.11       | x          | 0.18         | =            | 1.86           |                       |                     |                    | (29)    |
| Roof     |            | 40                              | I                          | 0                            |             | 40          | x          | 0.16         | =            | 6.4            |                       |                     |                    | (30)    |
| Total a  | rea of e   | elements                        | , m²                       |                              |             | 103         |            |              |              |                |                       |                     |                    | (31)    |
| Party v  | vall       |                                 |                            |                              |             | 16          | x          | 0            | =            | 0              |                       |                     |                    | (32)    |
| Interna  | al wall ** |                                 |                            |                              |             | 71          |            |              |              |                | ī                     |                     | $\exists  \models$ | (32c)   |
| Interna  | al floor   |                                 |                            |                              |             | 48          |            |              |              |                | Ī                     |                     | $\exists$          | (32d)   |
| Interna  | al ceiling | I                               |                            |                              |             | 44          |            |              |              |                | Ī                     |                     | $\dashv$           | (32e)   |
|          |            |                                 |                            | effective wi<br>Internal wal |             |             | ated using | g formula 1  | /[(1/U-valu  | ıe)+0.04] a    | as given in           | paragrapl           | <br>h 3.2          |         |
| Fabric   | heat los   | ss, W/K :                       | = S (A x                   | U)                           |             |             |            | (26)(30      | ) + (32) =   |                |                       |                     | 42.7               | (33)    |
| Heat c   | apacity    | Cm = S(                         | (Axk)                      |                              |             |             |            |              | ((28).       | (30) + (32     | 2) + (32a).           | (32e) =             | 5511.3             | 33 (34) |
| Therm    | al mass    | parame                          | eter (TMF                  | <sup>-</sup> = Cm ÷          | - TFA) in   | n kJ/m²K    |            |              | Indica       | tive Value     | : Low                 |                     | 100                | (35)    |
|          | -          |                                 | ere the de<br>tailed calci |                              | constructi  | ion are not | t known pi | recisely the | e indicative | e values of    | TMP in Ta             | able 1f             |                    |         |
| Therm    | al bridg   | es : S (L                       | x Y) cal                   | culated u                    | using Ap    | pendix ł    | <          |              |              |                |                       |                     | 6.88               | (36)    |
|          |            |                                 | are not kn                 | own (36) =                   | = 0.05 x (3 | 1)          |            |              |              |                |                       |                     |                    |         |
| Total fa | abric he   | at loss                         |                            |                              |             |             |            |              | (33) +       | · (36) =       |                       |                     | 49.58              | 3 (37)  |



| Ventila           | tion hea         | t loss ca            | alculated              | monthl      | y           |             |              |             | (38)m        | = 0.33 × (  | 25)m x (5)                   |           |         |              |
|-------------------|------------------|----------------------|------------------------|-------------|-------------|-------------|--------------|-------------|--------------|-------------|------------------------------|-----------|---------|--------------|
| [                 | Jan              | Feb                  | Mar                    | Apr         | May         | Jun         | Jul          | Aug         | Sep          | Oct         | Nov                          | Dec       |         |              |
| (38)m=            | 20.47            | 20.29                | 20.11                  | 19.28       | 19.13       | 18.41       | 18.41        | 18.28       | 18.69        | 19.13       | 19.44                        | 19.77     |         | (38)         |
| Heat tra          | ansfer c         | oefficie             | nt, W/K                |             |             |             |              |             | (39)m        | = (37) + (3 | 38)m                         |           |         |              |
| (39)m=            | 70.05            | 69.87                | 69.69                  | 68.87       | 68.71       | 67.99       | 67.99        | 67.86       | 68.27        | 68.71       | 69.02                        | 69.35     |         |              |
|                   |                  |                      |                        |             |             |             |              |             |              | -           | Sum(39)1.                    | 12 /12=   | 68.87   | (39)         |
| r                 |                  |                      | HLP), W/               | 1           | 4.70        |             |              |             | i            | = (39)m ÷   |                              |           |         |              |
| (40)m=            | 1.75             | 1.75                 | 1.74                   | 1.72        | 1.72        | 1.7         | 1.7          | 1.7         | 1.71         | 1.72        | 1.73<br>Sum(40) <sub>1</sub> | 1.73      | 4 70    | (40)         |
| Numbe             | r of day         | s in mo              | nth (Tab               | le 1a)      |             |             |              |             | ,            | Average =   | Sum(40)1.                    | 12 / 1 2= | 1.72    | (40)         |
| [                 | 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             | ter heat         | ing ene              | rgy requi              | irement:    |             |             |              |             |              |             |                              | kWh/ye    | ear:    |              |
| A                 |                  |                      | NI                     |             |             |             |              |             |              |             |                              |           |         | (10)         |
|                   |                  | pancy,<br>9, N = 1   | n<br>+ 1.76 x          | [1 - exp    | (-0.0003    | 349 x (TF   | -<br>A -13.9 | )2)] + 0.0  | )013 x (     | TFA -13.    |                              | 41        |         | (42)         |
|                   | A £ 13.9         |                      |                        |             | (           | - (         | ,            | / /]        |              |             | - /                          |           |         |              |
|                   |                  |                      | ater usag<br>hot water |             |             |             |              |             |              | se target o |                              | 7.6       |         | (43)         |
|                   |                  | -                    | person per             |             |             | -           | -            | o domovo    | a water at   | io larget e | 1                            |           |         |              |
| [                 | Jan              | Feb                  | Mar                    | Apr         | May         | Jun         | Jul          | Aug         | Sep          | Oct         | Nov                          | Dec       |         |              |
| L<br>Hot wate     |                  |                      | r day for ea           |             | · ·         |             |              | Ľ Š         |              | •••         |                              |           |         |              |
| (44)m=            | 74.36            | 71.66                | 68.95                  | 66.25       | 63.54       | 60.84       | 60.84        | 63.54       | 66.25        | 68.95       | 71.66                        | 74.36     |         |              |
| L                 |                  |                      | 1                      |             |             |             |              |             |              |             | m(44) <sub>112</sub> =       |           | 811.21  | (44)         |
| Energy c          | ontent of        | hot water            | used - cal             | culated mo  | onthly = 4. | 190 x Vd,r  | n x nm x C   | 0Tm / 3600  | ) kWh/mor    | nth (see Ta | ables 1b, 1                  | c, 1d)    |         |              |
| (45)m=            | 110.27           | 96.45                | 99.52                  | 86.77       | 83.26       | 71.84       | 66.57        | 76.39       | 77.31        | 90.09       | 98.34                        | 106.79    |         | _            |
| lf instant        | aneous w         | ater heati           | ng at point            | of use (no  | o hot water | r storage). | enter 0 in   | boxes (46   |              | Total = Su  | m(45) <sub>112</sub> =       | -         | 1063.62 | (45)         |
| г                 |                  | 14.47                | 14.93                  | 13.02       | 12.49       | 10.78       | 9.99         | 11.46       | 11.6         | 13.51       | 14.75                        | 16.02     |         | (46)         |
| (46)m=<br>Water s | 16.54<br>storage |                      | 14.95                  | 13.02       | 12.49       | 10.78       | 9.99         | 11.40       | 11.0         | 15.51       | 14.75                        | 10.02     |         | (46)         |
| Storage           | e volum          | e (litres)           | ) includir             | ng any so   | olar or W   | /WHRS       | storage      | within sa   | ame ves      | sel         |                              | 0         |         | (47)         |
| If comn           | nunity h         | eating a             | and no ta              | ınk in dw   | velling, e  | nter 110    | litres in    | (47)        |              |             |                              |           |         |              |
|                   |                  |                      | hot wate               | er (this ir | ncludes i   | nstantar    | neous co     | mbi boil    | ers) ente    | er '0' in ( | 47)                          |           |         |              |
|                   | storage          |                      | eclared I              | occ fact    | or ie kno   | wp (k\\/k   | v(davi):     |             |              |             |                              |           |         | (40)         |
|                   |                  |                      | m Table                |             |             |             | i/uay).      |             |              |             |                              | 0         |         | (48)         |
| •                 |                  |                      | storage                |             | oor         |             |              | (48) x (49) | ) –          |             |                              | 0         |         | (49)         |
| 0,                |                  |                      | eclared of             |             |             | or is not   |              | (40) X (43) | , –          |             |                              | 0         |         | (50)         |
| •                 |                  |                      | factor fr              | •           |             |             |              |             |              |             |                              | 0         |         | (51)         |
|                   | •                | -                    | ee secti               | on 4.3      |             |             |              |             |              |             |                              |           |         |              |
|                   |                  | from Ta              | ble 2a<br>m Table      | 2h          |             |             |              |             |              |             |                              | 0         |         | (52)         |
| -                 |                  |                      |                        |             | oor         |             |              | (17) ~ (54) | V (EQ) v (   | E2) -       |                              | 0         |         | (53)         |
|                   |                  | m water<br>54) in (5 | storage                | , KVVN/Y0   | dl          |             |              | (47) x (51) | ) X (52) X ( | 55) =       |                              | 0<br>0    |         | (54)<br>(55) |
|                   | . , .            |                      | culated f              | for each    | month       |             |              | ((56)m = (  | 55) × (41)   | m           | L'                           | 0         |         |              |
| (56)m=            |                  | 0                    |                        |             | 0           | 0           | 0            | 0           | 0            | 0           | 0                            |           |         | (56)         |
| (50)11=           | 0                | 0                    |                        | 0           | 0           |             |              |             | 0            | U           | 0                            | 0         |         | (50)         |





| If cylinder contain | ns dedicate | ed solar sto | orage, (57) | m = (56)m  | x [(50) – ( | [H11)] ÷ (5 | 0), else (5  | 7)m = (56)   | m where (   | H11) is fro   | om Append   | lix H         |      |
|---------------------|-------------|--------------|-------------|------------|-------------|-------------|--------------|--------------|-------------|---------------|-------------|---------------|------|
| (57)m= 0            | 0           | 0            | 0           | 0          | 0           | 0           | 0            | 0            | 0           | 0             | 0           |               | (57) |
| Primary circu       | it loss (ar | nual) fro    | om Table    | e 3        | -           | -           |              |              | -           |               | 0           |               | (58) |
| Primary circu       |             |              |             |            | 59)m = (    | (58) ÷ 36   | 65 × (41)    | m            |             |               |             |               |      |
| (modified b         | y factor f  | rom Tab      | le H5 if t  | here is s  | solar wat   | ter heati   | ng and a     | cylinde      | r thermo    | stat)         | -           |               |      |
| (59)m= 0            | 0           | 0            | 0           | 0          | 0           | 0           | 0            | 0            | 0           | 0             | 0           |               | (59) |
| Combi loss ca       | alculated   | for each     | month       | (61)m =    | (60) ÷ 30   | 65 × (41    | )m           |              |             |               |             | _             |      |
| (61)m= 37.89        | 32.98       | 35.14        | 32.67       | 32.38      | 30          | 31          | 32.38        | 32.67        | 35.14       | 35.34         | 37.89       |               | (61) |
| Total heat red      | quired for  | water h      | eating ca   | alculated  | for eac     | h month     | (62)m =      | 0.85 × (     | (45)m +     | (46)m +       | (57)m +     | (59)m + (61)m |      |
| (62)m= 148.17       | 129.43      | 134.66       | 119.44      | 115.64     | 101.85      | 97.58       | 108.78       | 109.98       | 125.23      | 133.68        | 144.69      |               | (62) |
| Solar DHW input     | calculated  | using App    | endix G o   | r Appendix | H (negati   | ve quantity | /) (enter '0 | ' if no sola | r contribut | ion to wate   | er heating) | -             |      |
| (add addition       | al lines if | FGHRS        | and/or \    | NWHRS      | applies     | , see Ap    | pendix C     | G)           |             |               |             |               |      |
| (63)m= 0            | 0           | 0            | 0           | 0          | 0           | 0           | 0            | 0            | 0           | 0             | 0           |               | (63) |
| Output from w       | vater hea   | ter          |             |            |             |             |              |              |             | _             |             | _             |      |
| (64)m= 148.17       | 129.43      | 134.66       | 119.44      | 115.64     | 101.85      | 97.58       | 108.78       | 109.98       | 125.23      | 133.68        | 144.69      |               | _    |
|                     |             |              |             |            |             |             | Outp         | out from w   | ater heate  | r (annual)₁   | 12          | 1469.11       | (64) |
| Heat gains fro      | om water    | heating      | , kWh/m     | onth 0.2   | 5 ´ [0.85   | × (45)m     | ı + (61)m    | n] + 0.8 x   | x [(46)m    | + (57)m       | + (59)m     | ]             |      |
| (65)m= 46.14        | 40.31       | 41.88        | 37.02       | 35.78      | 31.39       | 29.89       | 33.5         | 33.87        | 38.74       | 41.53         | 44.98       |               | (65) |
| include (57         | )m in cal   | culation     | of (65)m    | only if c  | ylinder i   | s in the o  | dwelling     | or hot w     | vater is fr | om com        | munity h    | eating        |      |
| 5. Internal g       | ains (see   | e Table 5    | 5 and 5a    | ):         |             |             |              |              |             |               |             |               |      |
| Metabolic gai       | ns (Table   | e 5), Wat    | ts          |            |             |             |              |              |             |               |             |               |      |
| Jan                 | Feb         | Mar          | Apr         | May        | Jun         | Jul         | Aug          | Sep          | Oct         | Nov           | Dec         |               |      |
| (66)m= 84.38        | 84.38       | 84.38        | 84.38       | 84.38      | 84.38       | 84.38       | 84.38        | 84.38        | 84.38       | 84.38         | 84.38       |               | (66) |
| Lighting gains      | s (calcula  | ited in Ap   | opendix     | L, equat   | ion L9 o    | r L9a), a   | lso see      | Table 5      |             |               |             |               |      |
| (67)m= 27.09        | 24.06       | 19.57        | 14.81       | 11.07      | 9.35        | 10.1        | 13.13        | 17.62        | 22.38       | 26.12         | 27.84       |               | (67) |
| Appliances ga       | ains (calo  | culated ir   | n Append    | dix L, eq  | uation L    | 13 or L1    | 3a), alsc    | see Ta       | ble 5       | -             |             |               |      |
| (68)m= 181.39       | 183.28      | 178.53       | 168.43      | 155.69     | 143.71      | 135.7       | 133.82       | 138.56       | 148.66      | 161.41        | 173.39      |               | (68) |
| Cooking gain        | s (calcula  | ated in A    | ppendix     | L, equa    | tion L15    | or L15a     | ), also se   | e Table      | e 5         | -             |             |               |      |
| (69)m= 44.84        | 44.84       | 44.84        | 44.84       | 44.84      | 44.84       | 44.84       | 44.84        | 44.84        | 44.84       | 44.84         | 44.84       |               | (69) |
| Pumps and fa        | ans gains   | (Table       | 5a)         | -          | -           | -           |              |              |             |               | -           | -             |      |
| (70)m= 3            | 3           | 3            | 3           | 3          | 3           | 3           | 3            | 3            | 3           | 3             | 3           |               | (70) |
| Losses e.g. e       | vaporatio   | on (nega     | tive valu   | es) (Tab   | ole 5)      |             |              |              |             |               |             | -             |      |
| (71)m= -56.25       | -56.25      | -56.25       | -56.25      | -56.25     | -56.25      | -56.25      | -56.25       | -56.25       | -56.25      | -56.25        | -56.25      |               | (71) |
| Water heating       | g gains (   | Table 5)     |             |            |             |             |              |              |             |               |             | -             |      |
| (72)m= 62.02        | 59.99       | 56.29        | 51.41       | 48.09      | 43.6        | 40.17       | 45.02        | 47.04        | 52.07       | 57.69         | 60.46       |               | (72) |
| Total interna       | l gains =   | =            |             |            | (66)        | )m + (67)m  | n + (68)m +  | + (69)m +    | (70)m + (7  | 1)m + (72)    | )m          | -             |      |
| (73)m= 346.47       | 343.3       | 330.35       | 310.63      | 290.82     | 272.62      | 261.95      | 267.94       | 279.2        | 299.08      | 321.18        | 337.66      |               | (73) |
| 6. Solar gair       | IS:         |              |             |            |             |             |              |              |             |               |             | -             |      |
| Solar gains are     | calculated  | using sola   | r flux from | Table 6a   | and assoc   | iated equa  | itions to co | onvert to th | ne applicat |               | tion.       |               |      |
| Orientation:        | Access F    | actor        | Area        |            | Flu         | X           |              | g_           | т           | FF<br>able 6c |             | Gains         |      |

m²

Table 6a

Table 6b

Table 6c

Table 6d

(W)



|         | _         |             |          |       |           |           |           |                 |           | _     |              |            |            | _        |        |     |      |   |       |       |
|---------|-----------|-------------|----------|-------|-----------|-----------|-----------|-----------------|-----------|-------|--------------|------------|------------|----------|--------|-----|------|---|-------|-------|
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 4               | 6.75      | x     |              | 0.57       | >          | (        | 0.7    |     | =    | 1 | 62.88 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 7               | 6.57      | x     |              | 0.57       | >          | · [      | 0.7    |     | =    | 2 | 66.76 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | g               | 97.53     | ×     |              | 0.57       | >          | (        | 0.7    |     | =    | 3 | 39.81 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 1               | 10.23     | ×     |              | 0.57       | >          | ] ،      | 0.7    |     | =    | 3 | 84.06 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 1               | 14.87     | ×     |              | 0.57       | >          | (        | 0.7    |     | =    | 4 | 00.21 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 1               | 10.55     | ×     |              | 0.57       | >          | ] ،      | 0.7    |     | =    | 3 | 85.15 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 1               | 08.01     | ×     |              | 0.57       | <b>)</b>   | -<br>    | 0.7    |     | =    | 3 | 76.31 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 1               | 04.89     | x     |              | 0.57       | >          | ۔<br>] ، | 0.7    |     | =    | 3 | 65.45 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 1               | 01.89     | ×     |              | 0.57       | >          | ] ،      | 0.7    |     | =    | 3 | 54.97 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 8               | 32.59     | ×     |              | 0.57       | <b>)</b>   | ] ،      | 0.7    |     | =    | 2 | 87.73 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         | 5               | 5.42      | x     |              | 0.57       | >          | ۔<br>] ، | 0.7    |     | =    | 1 | 93.07 | (78)  |
| South   | 0.9x      | 0.77        |          | x     | 12.       | 6         | x         |                 | 40.4      | ×     |              | 0.57       | <b>)</b>   | ] ،      | 0.7    |     | =    | 1 | 40.75 | (78)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 1               | 9.64      | ] ×   |              | 0.57       | _  ,       | ] ،      | 0.7    |     | =    | 3 | 38.77 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 3               | 8.42      | Ī×    |              | 0.57       | ] ,        | ٦        | 0.7    |     | =    | 7 | 75.85 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 6               | 3.27      | ×     |              | 0.57       | <b>_</b> , | ٦        | 0.7    |     | =    | 1 | 24.92 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 9               | 2.28      | Ī×    |              | 0.57       | ,          | ן י      | 0.7    |     | =    | 1 | 82.18 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 1               | 13.09     | Ī×    |              | 0.57       | ,          | ן י      | 0.7    |     | =    | 2 | 23.27 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 1               | 15.77     | ×     |              | 0.57       | <b>_</b> , | ٦        | 0.7    |     | =    | 2 | 28.56 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 1               | 10.22     | Ī×    |              | 0.57       | ,          | ן י      | 0.7    |     | =    | 2 | 217.6 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 9               | 4.68      | Ī×    |              | 0.57       | <b>–</b> , | ٦        | 0.7    |     | =    | 1 | 86.91 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 7               | 3.59      | Ī×    |              | 0.57       | ,          | ן י      | 0.7    |     | =    | 1 | 45.28 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 4               | 5.59      | Ī×    |              | 0.57       | _ ,        | ן י      | 0.7    |     | =    |   | 90    | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 2               | 24.49     | ] ×   |              | 0.57       | ,          | ן י      | 0.7    |     | =    | 4 | 48.35 | (80)  |
| West    | 0.9x      | 0.77        |          | x     | 7.1       | 4         | x         | 1               | 6.15      | ] ×   |              | 0.57       | ,          | ۲        | 0.7    |     | =    | 3 | 31.89 | (80)  |
|         | •         |             |          |       |           |           |           |                 |           | -     | -            |            |            | -        |        |     |      |   |       |       |
| Solar g | ains in   | watts, ca   | alculate | ed    | for eacl  | n mont    | h         |                 |           | (83)  | n = S        | Sum(74)m . | (82)       | m        |        |     |      |   |       |       |
| (83)m=  | 201.66    | 342.61      | 464.72   | 2     | 566.24    | 623.48    | 6         | 613.71          | 593.91    | 55    | 2.37         | 500.25     | 377        | .73      | 241.42 | 172 | 2.63 |   |       | (83)  |
| Total g | ains – i  | nternal a   | nd sol   | ar    | (84)m =   | : (73)m   | 1+(       | (83)m           | , watts   |       |              | -          |            |          |        | -   |      | - |       |       |
| (84)m=  | 548.13    | 685.91      | 795.08   | 3     | 876.87    | 914.3     | 8         | 886.33          | 855.86    | 82    | 0.31         | 779.45     | 676        | .81      | 562.6  | 510 | ).29 |   |       | (84)  |
| 7. Me   | an intei  | rnal temp   | peratur  | e (   | (heating  | seaso     | n)        |                 |           |       |              |            |            |          |        |     |      |   |       |       |
| Temp    | erature   | during h    | eating   | р     | eriods ir | n the liv | ving      | area            | from Tal  | ble 9 | ), Th        | 1 (°C)     |            |          |        |     |      |   | 21    | (85)  |
| Utilisa | ation fac | ctor for g  | ains fo  | r li  | iving are | ea, h1,r  | n (s      | see Ta          | ble 9a)   |       |              |            |            |          |        |     |      |   |       |       |
|         | Jan       | Feb         | Ма       | ·     | Apr       | Мау       | '         | Jun             | Jul       | 4     | Aug          | Sep        | 0          | ct       | Nov    | D   | )ec  | ] |       |       |
| (86)m=  | 0.88      | 0.82        | 0.75     |       | 0.66      | 0.55      |           | 0.43            | 0.32      | 0     | .35          | 0.5        | 0.6        | 69       | 0.83   | 0.  | 89   | ] |       | (86)  |
| Mean    | interna   | al temper   | ature i  | n I   | iving are | ea T1 (   | folle     | ow ste          | ps 3 to 7 | 7 in  | Tabl         | e 9c)      |            |          |        |     |      |   |       |       |
| (87)m=  | 18.45     | 18.92       | 19.47    | -     | 20.04     | 20.49     | _         | 20.79           | 20.92     | 1     | 0.9          | 20.69      | 20.        | 08       | 19.17  | 18  | .36  | ] |       | (87)  |
| Temp    | erature   | during h    | eating   |       | eriods ir | rest o    | f dv      | velling         | from Ta   | able  | 9 Т          | h2 (°C)    |            |          | -      |     |      | 4 |       |       |
| (88)m=  | 19.5      | 19.51       | 19.51    | Ť     | 19.53     | 19.53     | -         | 19.54           | 19.54     | 1     | 0, 1<br>0.54 | 19.54      | 19.        | 53       | 19.52  | 19  | .52  | 1 |       | (88)  |
|         |           |             |          | <br>r |           |           | _         |                 |           | I     |              | I          | I          |          | 1      | I   |      | 1 |       |       |
| (89)m=  | 0.86      | otor for ga | 0.72     | T     | 0.61      | 0.49      | , 112<br> | 2,m (Se<br>0.35 | 0.22      | T Ó   | .25          | 0.42       | 0.6        | 34       | 0.8    | 0   | 87   | 1 |       | (89)  |
|         |           |             |          |       |           |           |           |                 |           | 1     |              |            |            |          |        | L   |      | 1 |       | x - / |

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





| (90)m=  | 17.31  | 17.75   | 18.26  | 18.8  | 19.19  | 19.43                                | 19.51                      | 19.51  | 19.36  | 18.86   | 18.01  | 17.22                      |                                    | (90)   |
|---|--|---|--|---|--|--------------------------------------|----------------------------|--|--|---|--|----------------------------|------------------------------------|--|
|   |  | ļ   |  |   |  |                                      |                            |  | 1  | L<br>LA = Livin   | g area ÷ (4  | 4) =                       | 0.62                               | (91)   |
| Moon  | intorna  | ltompor   | oturo (fo  | r tho wh  | olo dwo  | lling) – fl                          | Δ                          | + (1 – fL  | ۸) <del> T</del> 2   |   |  | l                          |                                    |  |
| (92)m=  | 18.02  | 18.48   | 19.01  | 19.58   | 20   | 20.28                                | 20.39                      | + (1 – 1L<br>20.38   | 20.19  | 19.62   | 18.73  | 17.93                      |                                    | (92)   |
|   |  |   |  |   |  |                                      |                            | 4e, whe  |  |   | 10.70  | 17.00                      |                                    | (02)   |
| (93)m=  | 18.02  | 18.48   | 19.01  | 19.58   | 20   | 20.28                                | 20.39                      | 20.38  | 20.19  | 19.62   | 18.73  | 17.93                      |                                    | (93)   |
|   |  |   | uirement   |   |  | 20120                                | 20100                      |  | 20110  |   | 10110  |                            |                                    |  |
|   |  |   |  |   | re obtain  | ed at ste                            | en 11 of                   | Table 9  | n so tha   | t Ti m=('   | 76)m an  | d re-calc                  | ulate                              |  |
|   |  |   | or gains   | •   |  |                                      |                            |  | , 00 tha   | (, , , , , , , , , , , , , , , , , , ,                  | r ojin an  |                            | alato                              |  |
|   | Jan  | Feb   | Mar  | Apr   | May  | Jun                                  | Jul                        | Aug  | Sep  | Oct   | Nov  | Dec                        |                                    |  |
| Utilisa   | ation fac  | tor for g   | ains, hm   | :   |  |                                      |                            |  |  |   |  |                            |                                    |  |
| (94)m=  | 0.84   | 0.77  | 0.7  | 0.61  | 0.51   | 0.39                                 | 0.28                       | 0.31   | 0.46   | 0.65  | 0.78   | 0.85                       |                                    | (94)   |
| Usefu   | I gains,   | hmGm  | , W = (94  | 4)m x (84   | 4)m  |                                      |                            |  |  |   |  |                            |                                    |  |
| (95)m=  | 457.72   | 531.16  | 559.82   | 538.29  | 465.31   | 344.59                               | 242.63                     | 251.57   | 354.77   | 436.65  | 441.45   | 433.85                     |                                    | (95)   |
| Month   | nly aver   | age exte  | rnal tem   | perature  | from Ta  | able 8                               |                            |  |  |   |  |                            |                                    |  |
| (96)m=  | 4.3  | 4.9   | 6.5  | 8.9   | 11.7   | 14.6                                 | 16.6                       | 16.4   | 14.1   | 10.6  | 7.1  | 4.2                        |                                    | (96)   |
| Heat I  | loss rate  | i   | an intern  | · · ·   | erature,   | i                                    | - ,                        | x [(93)m   | – (96)m  | ]   |  |                            |                                    |  |
| (97)m=  | 961.16   | 948.7   | 872.13   | 735.23  | 570.37   | 386.19                               | 257.66                     | 269.86   | 415.95   | 620.09  | 802.97   | 952.38                     |                                    | (97)   |
| Space   |  | <u> </u>  | 1  |   |  | Nh/mont                              | h = 0.02                   | 24 x [(97]   | )m – (95   | í <u> </u>  | · · · · · · · · · · · · · · · · · · ·                                      |                            |                                    |  |
| (98)m=  | 374.56   | 280.59  | 232.36   | 141.8   | 78.17  | 0                                    | 0                          | 0  | 0  | 136.49  | 260.3  | 385.79                     |                                    | _  |
|   |  |   |  |   |  |                                      |                            | Tota   | l per year   | (kWh/year   | <sup>.</sup> ) = Sum(9   | 8)15,912 =                 | 1890.05                            | (98)   |
| Space   | e heatin   | a require   | omont in   | $kM/h/m^{2}$  | hiser  |                                      |                            |  |  |   |  | I I                        |                                    |  |
| -   |  | grequit   |  | KVVII/111-  | year   |                                      |                            |  |  |   |  |                            | 47.25                              | (99)   |
| 9a. En  |  | • •   |  |   | •  | ystems i                             | ncluding                   | ı micro-C  | CHP)   |   |  |                            | 47.25                              | (99)   |
|   |  | quiremer  |  |   | •  | ystems i                             | ncluding                   | ı micro-C  | CHP)   |   |  |                            | 47.25                              | (99)   |
| Space   | ergy rec<br>e heatir   | quiremer<br>ng:   |  | vidual h  | eating s   |                                      |                            |  | CHP)   |   |  |                            | 47.25<br>0                         | (99)   |
| <b>Spac</b><br>Fracti   | ergy rec<br>e heatir<br>on of sp   | quiremer<br>ng:<br>bace hea   | nts – Indi   | vidual h  | eating sy<br>y/supple  |                                      |                            |  |  |   |  | <br>                       |                                    | _  |
| <b>Spac</b><br>Fracti<br>Fracti   | ergy rec<br>e heatir<br>on of sp<br>on of sp   | quiremer<br>ng:<br>bace hea<br>bace hea   | nts – Indi<br>at from se   | vidual h<br>econdary<br>nain syst   | eating sy<br>y/supple<br>em(s)   |                                      | system                     |  | - (201) =  | (203)] =  |  |                            | 0                                  | (201)  |
| <b>Spac</b><br>Fracti<br>Fracti<br>Fracti   | ergy rec<br>e heatir<br>on of sp<br>on of sp<br>on of to   | quiremer<br>ng:<br>bace hea<br>bace hea<br>tal heati  | nts – Indi<br>at from se<br>at from m  | ividual h<br>econdar<br>nain syst<br>main sys   | eating sy<br>y/supple<br>em(s)<br>stem 1   |                                      | system                     | (202) = 1 -  | - (201) =  | (203)] =  |  |                            | 0                                  | (201)  |
| <b>Space</b><br>Fracti<br>Fracti<br>Fracti<br>Efficie   | ergy rec<br>e heatir<br>on of sp<br>on of to<br>ency of r  | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa   | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat   | ividual h<br>econdary<br>nain syst<br>main syst<br>ing syste  | eating sy<br>y/supple<br>em(s)<br>stem 1<br>em 1   | mentary                              | system                     | (202) = 1 -  | - (201) =  | (203)] =  |  |                            | 0<br>1<br>1                        | (201)<br>(202)<br>(204)<br>(206)                                   |
| <b>Space</b><br>Fracti<br>Fracti<br>Fracti<br>Efficie   | ergy rec<br>e heatir<br>on of sp<br>on of to<br>ency of r<br>ency of s   | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatii<br>main spa<br>seconda  | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple  | econdary<br>nain syst<br>main syst<br>ing syste<br>ementary   | eating s<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating   | mentary<br>g system                  | system                     | (202) = 1 -<br>(204) = (2  | - (201) =<br>02) × [1 –  |   | Nov  |                            | 0<br>1<br>1<br>88.8<br>0           | (201)<br>(202)<br>(204)<br>(206)<br>(208)                          |
| <b>Spac</b><br>Fracti<br>Fracti<br>Fracti<br>Efficie<br>Efficie   | ergy rec<br>e heatir<br>on of sp<br>on of to<br>ency of r<br>ency of s   | nguiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa<br>seconda   | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar   | econdar<br>nain syst<br>main syst<br>ing syste<br>ementar   | eating s<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May  | mentary<br>g system<br>Jun           | system                     | (202) = 1 -  | - (201) =  | (203)] =<br>Oct   | Nov  | Dec                        | 0<br>1<br>1<br>88.8                | (201)<br>(202)<br>(204)<br>(206)<br>(208)                          |
| <b>Spac</b><br>Fracti<br>Fracti<br>Fracti<br>Efficie<br>Efficie   | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>e heatin  | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatii<br>main spa<br>seconda<br>Feb<br>g require  | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>ement (c   | econdary<br>nain syst<br>main syst<br>ing syste<br>ementary<br>Apr<br>alculated   | eating s<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above   | mentary<br>g system<br>Jun           | system<br>n, %<br>Jul      | (202) = 1 -<br>(204) = (2<br>Aug   | - (201) =<br>02) × [1 –<br>Sep                                       | Oct   |  |                            | 0<br>1<br>1<br>88.8<br>0           | (201)<br>(202)<br>(204)<br>(206)<br>(208)                          |
| <b>Space</b><br>Fracti<br>Fracti<br>Efficie<br>Efficie<br>Space   | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>2 heatin<br>374.56  | quiremen<br>ng:<br>pace hea<br>pace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59  | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>ement (c<br>232.36   | econdary<br>nain syst<br>main syst<br>ing syste<br>ementary<br>Apr<br>alculated<br>141.8  | eating sy<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17                               | mentary<br>g system<br>Jun           | system                     | (202) = 1 -<br>(204) = (2  | - (201) =<br>02) × [1 –  |   | Nov<br>260.3   | Dec<br>385.79              | 0<br>1<br>1<br>88.8<br>0           | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>(208)                 |
| <b>Space</b><br>Fracti<br>Fracti<br>Efficie<br>Efficie<br>Space   | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>374.56<br>$n = \{[(98)$   | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20  | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>232.36<br>(4)] } x 1   | econdar<br>nain syst<br>main syst<br>ing syste<br>ementar<br>Apr<br>alculated<br>141.8<br>00 ÷ (20  | eating s<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17                                | mentary<br>g system<br>Jun<br>0      | system<br>n, %<br>Jul<br>0 | (202) = 1 -<br>(204) = (20<br>Aug  | - (201) =<br>02) × [1 -<br>Sep<br>0                                  | Oct<br>136.49   | 260.3  | 385.79                     | 0<br>1<br>1<br>88.8<br>0           | (201)<br>(202)<br>(204)<br>(206)<br>(208)                          |
| <b>Space</b><br>Fracti<br>Fracti<br>Efficie<br>Efficie<br>Space   | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>2 heatin<br>374.56  | quiremen<br>ng:<br>pace hea<br>pace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59  | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>ement (c<br>232.36   | econdary<br>nain syst<br>main syst<br>ing syste<br>ementary<br>Apr<br>alculated<br>141.8  | eating sy<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17                               | mentary<br>g system<br>Jun           | system<br>n, %<br>Jul      | (202) = 1 -<br>(204) = (2<br>Aug   | - (201) =<br>02) × [1 -<br>Sep<br>0                                  | Oct<br>136.49<br>153.7                                  | 260.3<br>293.13  | 385.79<br>434.45           | 0<br>1<br>1<br>88.8<br>0<br>kWh/ye | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>ear                   |
| Space<br>Fracti<br>Fracti<br>Efficie<br>Efficie<br>Space<br>(211)m  | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of s<br>ency of s<br>Jan<br>374.56<br>$n = \{[(98)$<br>421.8  | puiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20<br>315.98  | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>ement (c<br>232.36<br>(4)] } x 1<br>261.67   | econdar<br>nain syst<br>main syst<br>ing syste<br>ementar<br>alculated<br>141.8<br>00 ÷ (20<br>159.69   | eating sy<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17<br>06)<br>88.03               | mentary<br>g system<br>Jun<br>0      | system<br>n, %<br>Jul<br>0 | (202) = 1 -<br>(204) = (2<br>Aug   | - (201) =<br>02) × [1 -<br>Sep<br>0                                  | Oct<br>136.49<br>153.7                                  | 260.3  | 385.79<br>434.45           | 0<br>1<br>1<br>88.8<br>0           | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>(208)                 |
| Space<br>Fracti<br>Fracti<br>Efficie<br>Space<br>(211)m   | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>374.56<br>$n = \{[(98)$<br>421.8  | guiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20<br>315.98<br>g fuel (s                                     | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>232.36<br>(4)] } x 1<br>261.67<br>econdar  | vidual h<br>econdary<br>nain syst<br>main syst<br>ing syste<br>ementary<br>Apr<br>alculated<br>141.8<br>00 ÷ (20<br>159.69                        | eating sy<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17<br>06)<br>88.03               | mentary<br>g system<br>Jun<br>0      | system<br>n, %<br>Jul<br>0 | (202) = 1 -<br>(204) = (2<br>Aug   | - (201) =<br>02) × [1 -<br>Sep<br>0                                  | Oct<br>136.49<br>153.7                                  | 260.3<br>293.13  | 385.79<br>434.45           | 0<br>1<br>1<br>88.8<br>0<br>kWh/ye | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>ear                   |
| Space<br>Fracti<br>Fracti<br>Efficie<br>Space<br>(211)m<br>Space<br>= {[(98)  | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>374.56<br>$n = \{[(98)$<br>421.8<br>e heatin<br>(98)<br>(98)<br>(98)<br>(98)<br>(98)<br>(98)<br>(98)<br>(98)  | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20<br>315.98<br>g fuel (s<br>01)] } x 1                       | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>232.36<br>(4)] } x 1<br>261.67<br>econdar<br>00 ÷ (20  | vidual h<br>econdar<br>nain syst<br>main syst<br>ing syste<br>ementar<br>Apr<br>alculated<br>141.8<br>00 ÷ (20<br>159.69<br>y), kWh/<br>8)        | eating s<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17<br>06)<br>88.03<br>month       | mentary<br>g system<br>Jun<br>0      | system                     | (202) = 1 - (204) = (20) = ( | - (201) =<br>02) × [1 –<br>0<br>0<br>I (kWh/yea                      | Oct<br>136.49<br>153.7<br>ar) =Sum(2                    | 260.3<br>293.13<br>211) <sub>15,1012</sub>                                 | 385.79<br>434.45<br>=      | 0<br>1<br>1<br>88.8<br>0<br>kWh/ye | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>ear                   |
| Space<br>Fracti<br>Fracti<br>Efficie<br>Space<br>(211)m   | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>374.56<br>$n = \{[(98)$<br>421.8  | guiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20<br>315.98<br>g fuel (s                                     | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>232.36<br>(4)] } x 1<br>261.67<br>econdar  | vidual h<br>econdary<br>nain syst<br>main syst<br>ing syste<br>ementary<br>Apr<br>alculated<br>141.8<br>00 ÷ (20<br>159.69                        | eating sy<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17<br>06)<br>88.03               | mentary<br>g system<br>Jun<br>0      | system<br>n, %<br>Jul<br>0 | (202) = 1 - (204) = (20)<br>Aug<br>0<br>Tota<br>0  | - (201) =<br>02) × [1 –<br>0<br>0<br>1 (kWh/yea                      | Oct<br>136.49<br>153.7<br>ar) =Sum(2<br>0               | 260.3<br>293.13<br>211) <sub>15,1012</sub><br>0                            | 385.79<br>434.45<br>=<br>0 | 0<br>1<br>1<br>88.8<br>0<br>kWh/ye | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>(208)<br>ear<br>(211) |
| Space<br>Fracti<br>Fracti<br>Efficie<br>Efficie<br>Space<br>(211)m<br>Space<br>= {[(98)<br>(215)m=                    | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>a heatin<br>374.56<br>$n = \{[(98)$<br>421.8<br>e heatin<br>$m \times (20)$<br>0  | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20<br>315.98<br>g fuel (s<br>0)<br>1)] } x 1<br>0             | nts – Indi<br>at from se<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>232.36<br>(4)] } x 1<br>261.67<br>econdar<br>00 ÷ (20  | vidual h<br>econdar<br>nain syst<br>main syst<br>ing syste<br>ementar<br>Apr<br>alculated<br>141.8<br>00 ÷ (20<br>159.69<br>y), kWh/<br>8)        | eating s<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17<br>06)<br>88.03<br>month       | mentary<br>g system<br>Jun<br>0      | system                     | (202) = 1 - (204) = (20)<br>Aug<br>0<br>Tota<br>0  | - (201) =<br>02) × [1 –<br>0<br>0<br>1 (kWh/yea                      | Oct<br>136.49<br>153.7<br>ar) =Sum(2<br>0               | 260.3<br>293.13<br>211) <sub>15,1012</sub>                                 | 385.79<br>434.45<br>=<br>0 | 0<br>1<br>1<br>88.8<br>0<br>kWh/ye | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>ear                   |
| Space<br>Fracti<br>Fracti<br>Efficie<br>Space<br>(211)m<br>Space<br>= {[(98)<br>(215)m=                               | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>374.56<br>$a = \{[(98)$<br>421.8<br>e heatin<br>$m \times (20)$<br>0<br>heating   | quirement<br>ng:<br>bace heat<br>bace heat<br>tal heat<br>tal heat<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20<br>315.98<br>g fuel (s<br>01)] } x 1<br>0     | hts – Indi<br>at from se<br>at from m<br>ng from m<br>ace heat<br>ry/supple<br>Mar<br>232.36<br>(232.36<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(232.36)<br>(23 | vidual h<br>econdary<br>nain syst<br>main syst<br>ing syste<br>ementary<br>Apr<br>alculated<br>141.8<br>00 ÷ (20<br>159.69<br>y), kWh/<br>8)<br>0 | eating s<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17<br>06)<br>88.03<br>month       | mentary<br>g system<br>Jun<br>0      | system                     | (202) = 1 - (204) = (20)<br>Aug<br>0<br>Tota<br>0  | - (201) =<br>02) × [1 –<br>0<br>0<br>1 (kWh/yea                      | Oct<br>136.49<br>153.7<br>ar) =Sum(2<br>0               | 260.3<br>293.13<br>211) <sub>15,1012</sub><br>0                            | 385.79<br>434.45<br>=<br>0 | 0<br>1<br>1<br>88.8<br>0<br>kWh/ye | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>(208)<br>ear<br>(211) |
| Space<br>Fracti<br>Fracti<br>Efficie<br>Space<br>(211)m<br>Space<br>= {[(98)<br>(215)m=                               | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>374.56<br>$n = \{[(98)$<br>421.8<br>$a = \{[(98)$<br>421.8<br>$a = \{[(98)$<br>421.8<br>$a = \{[(98)$<br>$a = \{[(98)$<br>a = [(98)<br>a = [(98 | quiremen<br>ng:<br>bace hea<br>bace hea<br>tal heatin<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20<br>315.98<br>g fuel (s<br>01)] } x 1<br>0<br>g<br>ater hea | hts – Indi<br>at from se<br>at from m<br>ng from m<br>ace heat<br>ry/supple<br>Mar<br>232.36<br>(4)] $\}$ x 1<br>261.67<br>(20) $\div$ (20)<br>0<br>(0) $\div$ (20)<br>(0)   | vidual h<br>econdar<br>nain syst<br>main syst<br>ing syste<br>ementar<br>Apr<br>alculated<br>141.8<br>00 ÷ (20<br>159.69<br>y), kWh/<br>8)<br>0   | eating sy<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17<br>06)<br>88.03<br>month<br>0 | mentary<br>g system<br>Jun<br>)<br>0 | system                     | (202) = 1 -<br>(204) = (20<br>Aug<br>0<br>Tota<br>0<br>Tota  | - (201) =<br>02) × [1 -<br>Sep<br>0<br>1 (kWh/yea<br>0<br>1 (kWh/yea | Oct<br>136.49<br>153.7<br>ar) =Sum(2<br>0<br>ar) =Sum(2 | 260.3<br>293.13<br>211) <sub>15,1012</sub><br>0<br>215) <sub>15,1012</sub> | 385.79<br>434.45<br>=<br>0 | 0<br>1<br>1<br>88.8<br>0<br>kWh/ye | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>(208)<br>ear<br>(211) |
| Space<br>Fracti<br>Fracti<br>Efficie<br>Efficie<br>Space<br>(211)m<br>Space<br>= {[(98)<br>(215)m=<br>Water<br>Output | ergy rec<br>e heatin<br>on of sp<br>on of to<br>ency of r<br>ency of s<br>Jan<br>e heatin<br>374.56<br>$n = \{[(98)$<br>421.8<br>e heatin<br>m x (20)<br>n = keatin $m x (20)n = keatinm x (20)n = keatin$   | quirement<br>ng:<br>bace heat<br>bace heat<br>tal heat<br>tal heat<br>main spa<br>seconda<br>Feb<br>g require<br>280.59<br>)m x (20<br>315.98<br>g fuel (s<br>01)] } x 1<br>0     | hts – Indi<br>at from so<br>at from m<br>ng from<br>ace heat<br>ry/supple<br>Mar<br>232.36<br>(2) $X 1$<br>261.67<br>econdar<br>$00 \div (20)$<br>0<br>ter (calc<br>134.66   | vidual h<br>econdary<br>nain syst<br>main syst<br>ing syste<br>ementary<br>Apr<br>alculated<br>141.8<br>00 ÷ (20<br>159.69<br>y), kWh/<br>8)<br>0 | eating s<br>y/supple<br>em(s)<br>stem 1<br>em 1<br>y heating<br>May<br>d above<br>78.17<br>06)<br>88.03<br>month       | mentary<br>g system<br>Jun<br>0      | system                     | (202) = 1 - (204) = (20)<br>Aug<br>0<br>Tota<br>0  | - (201) =<br>02) × [1 –<br>0<br>0<br>1 (kWh/yea                      | Oct<br>136.49<br>153.7<br>ar) =Sum(2<br>0               | 260.3<br>293.13<br>211) <sub>15,1012</sub><br>0                            | 385.79<br>434.45<br>=<br>0 | 0<br>1<br>1<br>88.8<br>0<br>kWh/ye | (201)<br>(202)<br>(204)<br>(206)<br>(208)<br>(208)<br>ear<br>(211) |



| Space heating (main system 1)   |                          | (211)         | x        |            |            | 0.2            | 16                       | =        | 459.74                  | (261)               |
|---|--------------------------|---------------|----------|------------|------------|----------------|--------------------------|----------|-------------------------|---------------------|
|   |                          |               | /year    |            |            | Emiss<br>kg CO | i <b>on fac</b><br>2/kWh | tor      | Emissions<br>kg CO2/yea | r                   |
| 12a. CO2 emissions – Individual heati                                     | ng systems               | s includi     | ing mi   | cro-CHP    |            |                |                          |          |                         |                     |
| SAP rating (Section 12)   |                          |               |          |            |            |                |                          |          | 85.51                   | (258)               |
| Energy cost factor (ECF)  | [(255) x (256            | 6)] ÷ [(4)    | + 45.0]  | =          |            |                |                          |          | 1.04                    | (257)               |
| Energy cost deflator (Table 12)   |                          |               |          |            |            |                |                          |          | 0.42                    | (256)               |
| 11a. SAP rating - individual heating sy                                   | stems                    |               |          |            |            |                |                          |          |                         |                     |
| Total energy cost   | (245)(247)               | ) + (250).    | (254)    | =          |            |                |                          |          | 210.28                  | (255)               |
| Appendix Q items: repeat lines (253) ar                                   | nd (254) as              | needeo        | d        |            |            |                |                          |          |                         | -                   |
|   |                          | one of        | (233) to | o (235) x) |            | 13.            | 19                       | x 0.01 = | -80.25                  | (252)               |
| Additional standing charges (Table 12)                                    |                          |               |          |            |            |                |                          |          | 120                     | (251)               |
| Energy for lighting   |                          | (232)         | o appi   |            |            | 13.            |                          | x 0.01 = |                         | (250)               |
| (if off-peak tariff, list each of (230a) to (2                            | 230a) senai              |               | is ann   | licable a  | nd apply   | L              | 10                       |          |                         | J <sup>(2-73)</sup> |
| Pumps, fans and electric keep-hot   |                          | (231)         |          |            |            | 13.            |                          | x 0.01 = | 9.89                    | (249)               |
| Water heating cost (other fuel)   |                          | (219)         |          |            |            | 3.4            |                          | x 0.01 = | 61.33                   | (247)               |
| Space heating - secondary   |                          | (215)         |          |            |            | 13.            |                          | x 0.01 = | 0                       | (242)               |
| Space heating - main system 2   |                          | (213)         |          |            |            |                |                          | x 0.01 = | 0                       | (241)               |
| Space heating - main system 1   |                          | kWh/<br>(211) | •        |            |            | (Table         | ,<br>                    | x 0.01 = | £/year                  | (240)               |
| Toa. Fuel costs - Individual heating sys                                  | Stems.                   | Fuel          |          |            |            | Fuel P         | rice                     |          | Fuel Cost               |                     |
| 10a. Fuel costs - individual heating sys                                  |                          | 231) +        | (232).   | (2370)     | -          |                |                          |          | 3046.00                 | ] <sup>(336)</sup>  |
| Total delivered energy for all uses (211)                                 | ) (221) ± ( <sup>2</sup> | ′231\⊥        | (222)    | (227h)     | _          |                |                          |          | 3548.65                 | (338)               |
| Electricity generated by PVs  |                          |               |          |            |            |                |                          |          | -608.39                 | (233)               |
| Electricity for lighting  |                          |               |          | 20.11      | ().        | ·9/ -          |                          |          | 191.35                  | (232)               |
| Total electricity for the above, kWh/year                                 | r                        |               |          | sum        | of (230a). | (230a) =       | :                        |          | 75                      | (2300)              |
| boiler with a fan-assisted flue   |                          |               |          |            |            |                |                          | 45       | ]                       | (2000)<br>(230e)    |
| central heating pump:   |                          |               |          |            |            |                |                          | 30       | 1                       | (230c)              |
| Electricity for pumps, fans and electric k                                | keen-hot                 |               |          |            |            |                |                          |          | 1102.27                 | ]                   |
| Water heating fuel used   |                          |               |          |            |            |                |                          |          | 1762.27                 | ]                   |
| Annual totals<br>Space heating fuel used, main system 2                   | 1                        |               |          |            |            | k              | Wh/yea                   |          | <b>kWh/year</b> 2128.43 | 1                   |
|   |                          |               |          | Tota       | I = Sum(2' |                |                          |          | 1762.27                 | (219)               |
| (219)m= 172.39 151.13 158.15 141.7  | 139.31 12                | 28.11 1       | 22.74    | 136.82     | 138.34     | 148.92         | 156.52                   | 168.14   |                         | _                   |
| Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$ |                          |               |          |            |            |                |                          |          |                         |                     |
| (217)m= 85.95 85.64 85.15 84.29   | 83.01 7                  | 9.5           | 79.5     | 79.5       | 79.5       | 84.09          | 85.41                    | 86.05    |                         | (217)               |
| ·   |                          |               |          |            |            |                |                          |          | -                       |                     |

| Space heating (secondary)  | (215) x  | 0.519                     | = | 0  | (263)                                     |
|--|--|---------------------------|---|--|---|
| Water heating  | (219) x  | 0.216                     | = | 380.65                                       | (264)                                     |
| Space and water heating  | (261) + (262) + (263) + (26                                  | 4) =                      |   | 840.39                                       | (265)                                     |
| Electricity for pumps, fans and electric keep-hot  | (231) x  | 0.519                     | = | 38.93  | (267)                                     |
| Electricity for lighting   | (232) x  | 0.519                     | = | 99.31  | (268)                                     |
| Energy saving/generation technologies<br>Item 1  |  | 0.519                     | = | -315.76                                      | (269)                                     |
| Total CO2, kg/year   |  | sum of (265)(271) =       |   | 662.87                                       | (272)                                     |
| CO2 emissions per m <sup>2</sup>   |  | (272) ÷ (4) =             |   | 16.57  | (273)                                     |
| EI rating (section 14)   |  |                           |   | 90   | (274)                                     |
| 13a. Primary Energy  |  |                           |   |  |   |
|  | <b>Energy</b><br>kWh/year                                    | <b>Primary</b><br>factor  |   | <b>P. Energy</b><br>kWh/year                 |   |
| Space heating (main system 1)  | (011)  |                           |   |  |   |
|  | (211) x  | 1.22                      | = | 2596.69                                      | (261)                                     |
| Space heating (secondary)  | (211) X<br>(215) X   | 1.22                      | = | ,<br>  | (261)<br>(263)                            |
| Space heating (secondary)<br>Energy for water heating  |  |                           |   | 2596.69                                      | - · ·                                     |
|  | (215) x  | 3.07                      | = | 2596.69<br>0                                 | (263)                                     |
| Energy for water heating   | (215) x<br>(219) x   | 3.07                      | = | 2596.69<br>0<br>2149.97                      | (263)<br>(264)                            |
| Energy for water heating<br>Space and water heating  | (215) x<br>(219) x<br>(261) + (262) + (263) + (26            | 3.07<br>1.22<br>4) =      | = | 2596.69<br>0<br>2149.97<br>4746.65           | (263)<br>(264)<br>(265)                   |
| Energy for water heating<br>Space and water heating<br>Electricity for pumps, fans and electric keep-hot | (215) x<br>(219) x<br>(261) + (262) + (263) + (26<br>(231) x | (3.07)<br>(1.22)<br>(4) = | = | 2596.69<br>0<br>2149.97<br>4746.65<br>230.25 | (263)<br>(264)<br>(265)<br>(265)<br>(267) |

Primary energy kWh/m²/year

(272) ÷ (4) =





# **Regulations Compliance Report**

| Approved Documen<br>Printed on 24 Janua |                   |                                | na FSAP 2012 program, Version: 1.0.5. | 59  |
|---|-------------------|--------------------------------|---------------------------------------|-----|
| Project Information                     | :                 |                                |                                       |     |
| Assessed By:                            | Leighton Howe (S  | TRO004042)                     | Building Type: Flat                   |     |
| Dwelling Details:                       |                   |                                |                                       |     |
| NEW DWELLING D                          | ESIGN STAGE       |                                | Total Floor Area: 61m <sup>2</sup>    |     |
| Site Reference :                        | AL-10             |                                | Plot Reference: Flat 3                |     |
| Address :                               | Flat 3, Manor Cou | rt, 152 Abbey Road, LONDON     | I, NW6 4ST                            |     |
| Client Details:                         |                   |                                |                                       |     |
| Name:                                   |                   |                                |                                       |     |
| Address :                               |                   |                                |                                       |     |
| This report covers                      | items included v  | vithin the SAP calculations.   |                                       |     |
| It is not a complete                    |                   |                                |                                       |     |
| 1a TER and DER                          |                   |                                |                                       |     |
| Fuel for main heatin                    |                   | as                             |                                       |     |
| Fuel factor: 1.00 (ma                   | - /               |                                |                                       |     |
| Target Carbon Dioxi                     |                   |                                | 20.7 kg/m <sup>2</sup>                | 01/ |
| Dwelling Carbon Dic<br>1b TFEE and DFE  |                   | te (DER)                       | 15.78 kg/m²                           | OK  |
| Target Fabric Energ                     |                   | =)                             | 58.0 kWh/m²                           |     |
| Dwelling Fabric Energ                   | • • • •           |                                | 53.0 kWh/m <sup>2</sup>               |     |
|   | rgy Enciency (Dr  |                                | 55.0 KWI/III                          | ок  |
| 2 Fabric U-values                       |                   |                                |                                       |     |
| Element                                 |                   | Average                        | Highest                               |     |
| External wa                             | all               | 0.18 (max. 0.30)               | 0.18 (max. 0.70)                      | OK  |
| Party wall                              |                   | 0.00 (max. 0.20)               | -                                     | OK  |
| Floor                                   |                   | (no floor)                     |                                       |     |
| Roof                                    |                   | 0.16 (max. 0.20)               | 0.16 (max. 0.35)                      | OK  |
| Openings                                |                   | 1.40 (max. 2.00)               | 1.40 (max. 3.30)                      | ОК  |
| 2a Thermal bridgi                       |                   |                                |                                       |     |
|   |                   | rom linear thermal transmittan | ces for each junction                 |     |
| 3 Air permeability                      | ity at 50 pascals |                                | 5.00 (design value)                   |     |
| Maximum                                 | ity at 50 pascais |                                | 10.0                                  | ок  |
|   |                   |                                |                                       |     |
| 4 Heating efficient                     |                   | Deiler eveterne with redictor  |                                       |     |
| Main Heating                            | system:           | Data from manufacturer         | rs or underfloor heating - mains gas  |     |
|   |                   | Combi boiler                   |                                       |     |
|   |                   | Efficiency 88.0 % SEDBUK       | 2009                                  |     |
|   |                   | Minimum 88.0 %                 | 2000                                  | ок  |
|   |                   |                                |                                       |     |
| Secondary he                            | eating system:    | None                           |                                       |     |
| 5 Cylinder insulat                      | ion               |                                |                                       |     |
| Hot water Sto                           |                   | No cylinder                    |                                       |     |
|   |                   |                                |                                       | N/A |
|   |                   |                                |                                       |     |
|   |                   |                                |                                       |     |



Therm Energy Ltd 01903 884357

# **Regulations Compliance Report**

| Controls   |  |  |    |
|--|--|--|----|
| Space heating controls<br>Hot water controls:  | Programmer and at least<br>No cylinder thermostat<br>No cylinder | two room thermostats   | OK |
| Boiler interlock:  | Yes  |  | ок |
| Low energy lights  |  |  |    |
| Percentage of fixed lights v<br>Minimum  | vith low-energy fittings   | 100.0%<br>75.0%  | ОК |
| B Mechanical ventilation   |  |  |    |
| Not applicable   |  |  |    |
| Summertime temperature   |  |  |    |
| Overheating risk (South Ea   | ist England):  | Slight   | ОК |
| Overshading:<br>Windows facing: South<br>Windows facing: North<br>Windows facing: West |  | Average or unknown<br>12.18m <sup>2</sup><br>7.98m <sup>2</sup><br>4.2m <sup>2</sup> |    |
| Ventilation rate:<br>Blinds/curtains:  |  | 6.00<br>Dark-coloured curtain or roller<br>Closed 100% of daylight hours             |    |
| 10 Key features  |  |  |    |
| Party Walls U-value  |  | 0 W/m²K  |    |

Party vvalis U-value Photovoltaic array

|   |                                |                     | User D     | etails:                     |                                 |                   |          |           |                         |              |
|---|--------------------------------|---------------------|------------|-----------------------------|---------------------------------|-------------------|----------|-----------|-------------------------|--------------|
| Assessor Name:<br>Software Name:                          | Leighton Howe<br>Stroma FSAP 2 | -                   |            | Strom<br>Softwa             | are Ver                         |                   |          |           | 004042<br>on: 1.0.5.59  |              |
| Address :   | Flat 3, Manor Co               |                     |            | Address:<br>ad, LONE        |                                 | V6 4ST            |          |           |                         |              |
| 1. Overall dwelling dime                                  | nsions:                        |                     |            |                             |                                 |                   |          |           |                         |              |
|   |                                |                     | Area       | a(m²)                       |                                 | Av. He            | ight(m)  | _         | Volume(m <sup>3</sup> ) |              |
| Ground floor  |                                |                     |            | 61                          | (1a) x                          | 2                 | 2.4      | (2a) =    | 146.4                   | (3a)         |
| Total floor area TFA = (1a                                | a)+(1b)+(1c)+(1d)+             | (1e)+(1n            | )          | 61                          | (4)                             |                   |          |           |                         |              |
| Dwelling volume   |                                |                     |            |                             | (3a)+(3b)                       | )+(3c)+(3d        | l)+(3e)+ | .(3n) =   | 146.4                   | (5)          |
| 2. Ventilation rate:                                      |                                |                     |            |                             |                                 |                   |          |           |                         | _            |
| Number of chimneys  | main<br>heating<br>0 +         | secondar<br>heating | у<br>ヿ + Г | other<br>0                  | 7 = [                           | total             | X 4      | 40 =      | m <sup>3</sup> per hour | ](6a)        |
| Number of open flues                                      |                                | 0                   | 」          | 0                           | 」 L<br>ヿ = Г                    | 0                 |          | 20 =      | 0                       | ](6b)        |
| Number of intermittent fa                                 |                                | 0                   |            | 0                           | JĽ                              | -                 |          | 10 =      |                         |              |
|   |                                |                     |            |                             | Ļ                               | 3                 |          |           | 30                      | (7a)         |
| Number of passive vents                                   |                                |                     |            |                             |                                 | 0                 | x ?      | 10 =      | 0                       | (7b)         |
| Number of flueless gas fi                                 | res                            |                     |            |                             |                                 | 0                 | X 4      | 40 =      | 0                       | (7c)         |
|   |                                |                     |            |                             |                                 |                   |          | Air ch    | anges per ho            | ur           |
| Infiltration due to chimney                               | een carried out or is inte     |                     |            |                             | continue fr                     | 30<br>om (9) to ( |          | ÷ (5) =   | 0.2                     | (8)          |
| Number of storeys in the<br>Additional infiltration       | ne dwelling (ns)               |                     |            |                             |                                 |                   | [(0)]    | -1]x0.1 = | 0                       | (9)<br>(10)  |
| Structural infiltration: 0                                | .25 for steel or timb          | er frame or         | 0.35 foi   | r masonr                    | v constr                        | uction            | [(9)     | -1]x0.1 = | 0                       | (10)         |
| if both types of wall are pr<br>deducting areas of openir | resent, use the value co       |                     |            |                             |                                 |                   |          |           |                         |              |
| If suspended wooden f                                     | loor, enter 0.2 (uns           | ealed) or 0.        | 1 (seale   | ed), else                   | enter 0                         |                   |          |           | 0                       | (12)         |
| If no draught lobby, en                                   |                                |                     |            |                             |                                 |                   |          |           | 0                       | (13)         |
| Percentage of windows                                     | s and doors draugh             | t stripped          |            | 0.25 - [0.2                 | $(\mathbf{x}(1\mathbf{A}) + 1)$ | 001 -             |          |           | 0                       | (14)         |
| Window infiltration                                       |                                |                     |            | (8) + (10)                  |                                 | -                 | + (15) = |           | 0                       | (15)         |
| Air permeability value,                                   | a50 expressed in a             | cubic metre         |            |                             |                                 |                   |          | area      | 0                       | (16)<br>(17) |
| If based on air permeabil                                 | • •                            |                     | •          | •                           | •                               |                   |          |           | 0.45                    | (18)         |
| Air permeability value applie                             | s if a pressurisation test     | has been don        | e or a deg | gree air pei                | rmeability                      | is being u        | sed      |           |                         |              |
| Number of sides sheltere                                  | d                              |                     |            | (20) - 1                    | [0 075 v (1                     | 0)1               |          |           | 1                       | (19)         |
| Shelter factor  | ing chalter factor             |                     |            | (20) = 1 -  <br>(21) = (18) |                                 | [9)] =            |          |           | 0.92                    | (20)         |
| Infiltration rate incorporat                              | -                              | and                 |            | (21) – (10)                 | )                               |                   |          |           | 0.42                    | (21)         |
| Jan Feb   | Mar Apr Ma                     | - i - i             | Jul        | Aug                         | Sep                             | Oct               | Nov      | Dec       | ]                       |              |
| Monthly average wind sp                                   |                                |                     | 0 0.1      |                             | 000                             |                   |          |           | 1                       |              |
| (22)m= 5.1 5  | 4.9 4.4 4.3                    | 3.8                 | 3.8        | 3.7                         | 4                               | 4.3               | 4.5      | 4.7       | ]                       |              |
| Wind Factor (22a)m = (22                                  | I                              | I                   |            | 1                           | 1                               | 1                 | 1        | 1         | J                       |              |
|   | 1.23 1.1 1.03                  | 3 0.95              | 0.95       | 0.92                        | 1                               | 1.08              | 1.12     | 1.18      |                         |              |
|   | I                              |                     |            | I                           | I                               | I                 | ļ        | Į         | 1                       |              |

thermenergy

| Adjuste | ed infiltr | ation rat                       | e (allowii                            | ng for sh  | nelter an  | d wind s    | peed) =                                       | = (21a) x     | (22a)m       |             |  |           | _                 |                      |
|---------|------------|---------------------------------|---------------------------------------|------------|------------|-------------|---|---------------|--------------|-------------|--|-----------|-------------------|----------------------|
|         | 0.54       | 0.53                            | 0.52                                  | 0.46       | 0.45       | 0.4         | 0.4   | 0.39          | 0.42         | 0.45        | 0.47   | 0.49      | ]                 |                      |
|         |            | c <i>tive air</i><br>al ventila | change i                              | ate for t  | he appli   | cable ca    | se  |               |              |             |  |           |                   | (23a)                |
|         |            |                                 |                                       | ndix N. (2 | 3b) = (23a | i) x Fmv (e | equation                                      | (N5)) , othe  | rwise (23b   | ) = (23a)   |  |           | 0                 | (23a)<br>(23b)       |
|         |            |                                 |                                       |            |            |             |   | m Table 4h    |              | ) (200)     |  |           | 0                 | (23b)<br>(23c)       |
|         |            |                                 |                                       |            | Ũ          |             | ``  | ′HR) (24a     | ,            | 2h)m + ('   | 23h) <b>x</b> ['   | 1 – (23c) | -                 | (230)                |
| (24a)m= | 0          |                                 |                                       | 0          | 0          | 0           |   |               |              |             | 0  | 0         | ]                 | (24a)                |
|         | balance    | d mech                          | I I I I I I I I I I I I I I I I I I I | ntilation  | without    | heat rec    | L<br>coverv (                                 | <br>MV) (24t  | (22)         | 2b)m + (2   | 23b)   | <u> </u>  | 1                 |                      |
| (24b)m= | 0          | 0                               | 0                                     | 0          | 0          | 0           | 0   | 0             | 0            | 0           | 0  | 0         | ]                 | (24b)                |
|         | whole h    | use ex                          | tract ven                             | tilation o | or positiv | re input v  | ı<br>ventilati                                | on from o     | utside       |             |  |           | 1                 |                      |
| ,       |            |                                 |                                       |            | •          | •           |   | 4c) = (22b    |              | .5 × (23b   | )  |           |                   |                      |
| (24c)m= | 0          | 0                               | 0                                     | 0          | 0          | 0           | 0   | 0             | 0            | 0           | 0  | 0         | ]                 | (24c)                |
| ,       |            |                                 |                                       |            | •          | •           |   | ion from I    |              |             |  | -         | -                 |                      |
| 1       | · ,        | · · · · · ·                     | <u> </u>                              |            | <i>.</i>   | <u>`</u>    | <u> </u>                                      | 0.5 + [(2     | <u> </u>     | <u> </u>    |  |           | 1                 | (5.4.1)              |
| (24d)m= | 0.64       | 0.64                            | 0.63                                  | 0.61       | 0.6        | 0.58        | 0.58  | 0.58          | 0.59         | 0.6         | 0.61   | 0.62      | J                 | (24d)                |
|         |            |                                 |                                       |            | , <u>,</u> | , <u> </u>  | <u>, , , , , , , , , , , , , , , , , , , </u> | 4d) in box    | r`´´         |             |  |           | 1                 |                      |
| (25)m=  | 0.64       | 0.64                            | 0.63                                  | 0.61       | 0.6        | 0.58        | 0.58  | 0.58          | 0.59         | 0.6         | 0.61   | 0.62      | J                 | (25)                 |
| 3. He   | at losse   | s and he                        | eat loss p                            | aramete    | er:        |             |   |               |              |             |  |           |                   |                      |
| ELEN    | IENT       | Gros                            |                                       | Openin     | -          | Net Ar      |   | U-val         |              | AXU         |  | k-value   |                   | AXk                  |
| Doors   |            | area                            | (m²)                                  | m          | 2          | A ,n        |   | W/m2          |              | (W/ł        | \)     \ | kJ/m²∙l   | n                 | kJ/K                 |
|         |            | . 1                             |                                       |            |            | 1.89        |   |               | =            | 2.646       |  |           |                   | (26)                 |
|         | ws Type    |                                 |                                       |            |            | 12.18       |   | 1/[1/( 1.4 )+ |              | 16.15       |  |           |                   | (27)                 |
|         | ws Type    |                                 |                                       |            |            | 7.98        |   | 1/[1/( 1.4 )+ |              | 10.58       |  |           |                   | (27)                 |
|         | ws Type    | 3<br>                           |                                       |            |            | 4.2         | ×   | 1/[1/( 1.4 )+ | 0.04] =      | 5.57        | ╡,   |           |                   | (27)                 |
| Walls 7 |            | 66                              |                                       | 24.3       | 6          | 41.64       | . х   | 0.18          | =            | 7.5         |  |           | $\dashv$ $\vdash$ | (29)                 |
| Walls 7 | ype2       | 16                              | ;                                     | 1.89       |            | 14.11       | ×   | 0.18          | =            | 2.59        |  |           | $\exists$         | (29)                 |
| Roof    |            | 66                              |                                       | 0          |            | 66          | ×   | 0.16          | =            | 10.56       |  |           |                   | (30)                 |
|         |            | lements                         | , m²                                  |            |            | 148         |   |               |              |             |  |           |                   | (31)                 |
| Party v | vall       |                                 |                                       |            |            | 16          | x   | 0             | =            | 0           |  |           |                   | (32)                 |
| Interna | I wall **  |                                 |                                       |            |            | 71          |   |               |              |             |  |           |                   | (32c)                |
| Interna | l floor    |                                 |                                       |            |            | 48          |   |               |              |             |  |           |                   | (32d)                |
| Interna | l ceiling  | l                               |                                       |            |            | 44          |   |               |              |             |  |           |                   | (32e)                |
|         |            |                                 | ows, use e<br>sides of in             |            |            |             | ated usin                                     | g formula 1   | /[(1/U-valı  | ıe)+0.04] a | s given in   | paragraph | 1 3.2             |                      |
| Fabric  | heat los   | s, W/K                          | = S (A x                              | U)         |            |             |   | (26)(30)      | ) + (32) =   |             |  |           | 55.5              | 9 (33)               |
| Heat c  | apacity    | Cm = S(                         | (Axk)                                 |            |            |             |   |               | ((28).       | (30) + (32  | 2) + (32a).  | (32e) =   | 5874.             | 75 <mark>(34)</mark> |
| Therma  | al mass    | parame                          | ter (TMF                              | ? = Cm ÷   | - TFA) ir  | ∩ kJ/m²K    |   |               | Indica       | tive Value: | Low  |           | 100               | (35)                 |
|         | -          |                                 | ere the det<br>tailed calcu           |            | constructi | ion are not | t known p                                     | precisely the | e indicative | e values of | TMP in Ta  | able 1f   |                   |                      |
| Therma  | al bridg   | es : S (L                       | x Y) calo                             | culated u  | using Ap   | pendix ł    | <   |               |              |             |  |           | 6.88              | (36)                 |

if details of thermal bridging are not known  $(36) = 0.05 \times (31)$ 



| Total f   | abric he           | at loss                |              |            |                |             |            |                        | (33) +                | (36) =          |   |          | 62.47   | (37) |
|-----------|--------------------|------------------------|--------------|------------|----------------|-------------|------------|------------------------|-----------------------|-----------------|---|----------|---------|------|
|           |                    | at loss ca             | alculated    | l monthly  | V              |             |            |                        |                       |                 | 25)m x (5)                              |          | 02.47   |      |
|           | Jan                | Feb                    | Mar          | Apr        | May            | Jun         | Jul        | Aug                    | Sep                   | Oct             | Nov                                     | Dec      |         |      |
| (38)m=    | 31.11              | 30.84                  | 30.57        | 29.33      | 29.1           | 28.02       | 28.02      | 27.82                  | 28.43                 | 29.1            | 29.57                                   | 30.06    |         | (38) |
| Heat tr   | ansfer o           | coefficier             | nt. W/K      |            |                |             | 1          |                        | (39)m                 | = (37) + (3     | 38)m                                    |          |         |      |
| (39)m=    | 93.58              | 93.31                  | 93.04        | 91.8       | 91.57          | 90.49       | 90.49      | 90.28                  | 90.9                  | 91.57           | 92.04                                   | 92.53    |         |      |
|           |                    | 1                      |              |            |                |             | 1          |                        |                       | •               | Sum(39)1.                               | 12 /12=  | 91.8    | (39) |
|           | · ·                | ameter (H              | ,<br>1       |            |                |             |            |                        | · · ·                 | = (39)m ÷       | · · ·                                   | 4.50     |         |      |
| (40)m=    | 1.53               | 1.53                   | 1.53         | 1.5        | 1.5            | 1.48        | 1.48       | 1.48                   | 1.49                  | 1.5             | 1.51<br>Sum(40) <sub>1.</sub>           | 1.52     | 1.5     | (40) |
| Numbe     | er of day          | /s in moi              | nth (Tab     | le 1a)     |                |             |            |                        |                       | Average =       | Sum(40)1.                               | 12 / 12= | 1.5     | (40) |
|           | 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 enei              | rgy requi    | irement:   |                |             |            |                        |                       |                 |   | kWh/ye   | ear:    |      |
| if TF     |                    |                        |              | [1 - exp   | (-0.0003       | 849 x (TF   | -13.9      | )2)] + 0.(             | 0013 x ( <sup>-</sup> | TFA -13.        |   | 01       |         | (42) |
| Reduce    | the annua          |                        | hot water    | usage by a | 5% if the a    | lwelling is | designed   | (25 x N)<br>to achieve |                       | se target o     |   | .93      |         | (43) |
|           | Jan                | Feb                    | Mar          | Apr        | May            | Jun         | Jul        | Aug                    | Sep                   | Oct             | Nov                                     | Dec      |         |      |
| Hot wate  | er usage i         | n litres per           | r day for ea | ach month  | Vd,m = fa      | ctor from   | Table 1c x | (43)                   |                       |                 |   |          |         |      |
| (44)m=    | 90.13              | 86.85                  | 83.57        | 80.29      | 77.02          | 73.74       | 73.74      | 77.02                  | 80.29                 | 83.57           | 86.85                                   | 90.13    |         |      |
| Energy o  | content of         | hot water              | used - cal   | culated mo | onthly $= 4$ . | 190 x Vd,r  | m x nm x D | 0Tm / 3600             |                       |                 | <mark>m(44)</mark> 112 =<br>ables 1b, 1 |          | 983.18  | (44) |
| (45)m=    | 133.65             | 116.89                 | 120.62       | 105.16     | 100.91         | 87.07       | 80.69      | 92.59                  | 93.7                  | 109.19          | 119.19                                  | 129.44   |         |      |
|           |                    |                        |              |            |                |             |            |                        |                       | I<br>Total = Su | l<br>m(45) <sub>112</sub> =             | =        | 1289.11 | (45) |
| lf instan | taneous w          | vater heatii           | ng at point  | of use (no | hot water      | r storage), | enter 0 in | boxes (46              | ) to (61)             |                 | -                                       |          |         |      |
| (46)m=    | 20.05              | 17.53                  | 18.09        | 15.77      | 15.14          | 13.06       | 12.1       | 13.89                  | 14.05                 | 16.38           | 17.88                                   | 19.42    |         | (46) |
|           | storage<br>e volum |                        | includin     | na anv so  | olar or M      | /WHRS       | storage    | within sa              | ame ves               | sel             |   | 0        |         | (47) |
| -         |                    | neating a              |              |            |                |             | -          |                        |                       | 001             |   | 0        |         | (-1) |
| Otherv    | •                  | o stored               |              |            | •              |             |            | ombi boil              | ers) ente             | er '0' in (     | 47)                                     |          |         |      |
| a) If m   | anufact            | turer's de             | eclared l    | oss facto  | or is kno      | wn (kWł     | n/day):    |                        |                       |                 |   | 0        |         | (48) |
| Tempe     | erature f          | actor fro              | m Table      | 2b         |                |             |            |                        |                       |                 |   | 0        |         | (49) |
|           |                    | om water               | -            |            |                |             |            | (48) x (49)            | ) =                   |                 |   | 0        |         | (50) |
|           |                    | turer's de<br>age loss |              | •          |                |             |            |                        |                       |                 |   | 0        |         | (51) |
|           |                    | neating s              |              |            | 0 2 (100       | n, na o, ac | ~y)        |                        |                       |                 |   | 0        |         |      |
| Volum     | e factor           | from Ta                | ble 2a       |            |                |             |            |                        |                       |                 |   | 0        |         | (52) |
| Tempe     | erature f          | actor fro              | m Table      | 2b         |                |             |            |                        |                       |                 |   | 0        |         | (53) |
|           |                    | om water               | -            | , kWh/ye   | ear            |             |            | (47) x (51)            | ) x (52) x (          | 53) =           |   | 0        |         | (54) |
| Enter     | (50) or            | (54) in (5             | ))           |            |                |             |            |                        |                       |                 |   | 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)   | m = (56)m   | x [(50) – (   | H11)] ÷ (5   | 0), else (5   | 7)m = (56)   | m where (  | (H11) is fro   | m Append  | lix H         |                                      |
| (57)m=   | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0  | 0  | 0   |               | (57)                                 |
| Primar   | y circuit  | loss (ar   | nnual) fro   | om Table   | e 3   |   |  |   |  | -  |  | 0   |               | (58)                                 |
|  | •  |  |  |  | month (   | 59)m = (  | (58) ÷ 36  | 5 × (41)  | m  |  |  |   |               |                                      |
| (mo  | dified by  | factor f   | rom Tab  | le H5 if t   | here is s   | olar wat  | er heatir  | ng and a  | cylinde  | r thermo   | ostat)   |   |               |                                      |
| (59)m=   | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0  | 0  | 0   |               | (59)                                 |
| Combi  | loss ca  | lculated   | for each   | month (  | (61)m =   | (60) ÷ 36   | 65 × (41)  | m   |  |  |  |   |               |                                      |
| (61)m=   | 45.93  | 39.97  | 42.59  | 39.6   | 39.25   | 36.36   | 37.58  | 39.25   | 39.6   | 42.59  | 42.83  | 45.93   |               | (61)                                 |
| Total h  | eat requ   | uired for  | water he   | eating ca  | alculated   | for eacl  | h month  | (62)m =   | 0.85 × (   | (45)m +  | (46)m +  | (57)m +   | (59)m + (61)m |                                      |
| (62)m=   | 179.58   | 156.87   | 163.21   | 144.76   | 140.15  | 123.44  | 118.26   | 131.84  | 133.29   | 151.78   | 162.02   | 175.36  |               | (62)                                 |
|  |  |  |  |  |   |   |  |   |  | r contribut  | tion to wate   | er heating)   |               |                                      |
| (add a   | dditiona   | l lines if   | FGHRS  | and/or \   | WWHRS   | applies   | , see Ap   | pendix (  | G)   |  |  |   |               |                                      |
| (63)m=   | 0  | 0  | 0  | 0  | 0   | 0   | 0  | 0   | 0  | 0  | 0  | 0   |               | (63)                                 |
| Output   | from w   | ater hea   | ter  | -  |   |   | -  |   |  | -  |  |   |               |                                      |
| (64)m=   | 179.58   | 156.87   | 163.21   | 144.76   | 140.15  | 123.44  | 118.26   | 131.84  | 133.29   | 151.78   | 162.02   | 175.36  |               |                                      |
|  |  |  |  |  |   |   |  | Outp  | out from w   | ater heate   | r (annual)₁  | 12  | 1780.56       | (64)                                 |
| Heat g   | ains fro   | m water  | heating,   | kWh/m  | onth 0.2  | 5´[0.85   | × (45)m  | + (61)m   | n] + 0.8 x   | (46)m  | + (57)m  | + (59)m   | ]             |                                      |
| (65)m=   | 55.92  | 48.86  | 50.75  | 44.87  | 43.36   | 38.04   | 36.22  | 40.6  | 41.05  | 46.95  | 50.34  | 54.52   |               | (65)                                 |
| (00)   |  |  |  |  |   |   |  |   |  |  |  |   |               |                                      |
|  | lde (57)   | n in calo  | ulation (  | of (65)m   | only if c   | ylinder i   | s in the c   | dwelling  | or hot w   | ater is fi   | rom com  | munity h  | leating       |                                      |
| inclu  | . ,  |  | culation of Table 5  | . ,  | -   | ylinder is  | s in the c   | dwelling  | or hot w   | ater is fi   | rom com  | nunity h  | leating       |                                      |
| inclu<br>5. Int  | ternal ga  | ains (see  |  | 5 and 5a   | -   | ylinder is  | s in the c   | dwelling  | or hot w   | ater is fi   | rom com  | nunity h  | leating       |                                      |
| inclu<br>5. Int  | ternal ga  | ains (see  | e Table 5  | 5 and 5a   | -   | ylinder is<br>Jun   | s in the c<br>Jul  | dwelling<br>Aug   | or hot w<br>Sep  | ater is fi<br>Oct  | rom com  | munity h  | leating       |                                      |
| inclu<br>5. Int  | ernal ga   | ains (see<br>as (Table   | e Table 5<br>e 5), Wat   | 5 and 5a   | ):  |   | i  |   | Ī  | i  | 1  |   | leating       | (66)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains  | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula   | e Table 5<br>e 5), Wat<br>Mar<br>120.59<br>ted in Ap   | ts<br>Apr<br>120.59<br>Apr   | ):<br>May<br>120.59<br>L, equati  | Jun<br>120.59<br>ion L9 of  | Jul<br>120.59<br>r L9a), a   | Aug<br>120.59<br>Iso see  | Sep<br>120.59<br>Table 5   | Oct  | Nov  | Dec   | leating       | (66)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains  | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula   | e Table 5<br>e 5), Wat<br>Mar<br>120.59<br>ted in Ap   | ts<br>Apr<br>120.59<br>Apr   | ):<br>May<br>120.59   | Jun<br>120.59<br>ion L9 of  | Jul<br>120.59<br>r L9a), a   | Aug<br>120.59<br>Iso see  | Sep<br>120.59<br>Table 5   | Oct  | Nov  | Dec   | leating       | (66)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=   | olic gain<br>Jan<br>120.59<br>g gains<br>39.11   | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula<br>34.73  | 2 Table 5<br>2 5), Wat<br>Mar<br>120.59<br>ted in Ap<br>28.25  | and 5a<br>ts<br>Apr<br>120.59<br>opendix<br>21.39  | ):<br>May<br>120.59<br>L, equati  | Jun<br>120.59<br>ion L9 of<br>13.5  | Jul<br>120.59<br>r L9a), a<br>14.58  | Aug<br>120.59<br>Iso see<br>18.96   | Sep<br>120.59<br>Table 5<br>25.44  | Oct<br>120.59<br>32.3  | Nov<br>120.59  | Dec<br>120.59   | leating       |                                      |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=   | olic gain<br>Jan<br>120.59<br>g gains<br>39.11   | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula<br>34.73  | 2 Table 5<br>2 5), Wat<br>Mar<br>120.59<br>ted in Ap<br>28.25  | and 5a<br>ts<br>Apr<br>120.59<br>opendix<br>21.39  | ):<br>May<br>120.59<br>L, equati<br>15.99   | Jun<br>120.59<br>ion L9 of<br>13.5  | Jul<br>120.59<br>r L9a), a<br>14.58  | Aug<br>120.59<br>Iso see<br>18.96   | Sep<br>120.59<br>Table 5<br>25.44  | Oct<br>120.59<br>32.3  | Nov<br>120.59  | Dec<br>120.59   | leating       |                                      |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliat<br>(68)m=  | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88  | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6  | <ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>sulated in</li> <li>257.75</li> </ul>  | Apr           120.59           opendix           21.39           Appendix           243.17   | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, eq  | Jun<br>120.59<br>on L9 of<br>13.5<br>uation L<br>207.47   | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92  | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2   | Sep<br>120.59<br>Table 5<br>25.44<br>see Ta<br>200.05                                    | Oct<br>120.59<br>32.3<br>ble 5<br>214.63                                       | Nov<br>120.59<br>37.7  | Dec<br>120.59<br>40.19  | leating       | (67)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliat<br>(68)m=  | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88  | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6  | <ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>sulated in</li> <li>257.75</li> </ul>  | Apr           120.59           opendix           21.39           Appendix           243.17   | ):<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77   | Jun<br>120.59<br>on L9 of<br>13.5<br>uation L<br>207.47   | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92  | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2   | Sep<br>120.59<br>Table 5<br>25.44<br>see Ta<br>200.05                                    | Oct<br>120.59<br>32.3<br>ble 5<br>214.63                                       | Nov<br>120.59<br>37.7  | Dec<br>120.59<br>40.19  | leating       | (67)                                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Applia<br>(68)m=<br>Cookir<br>(69)m=   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>ng gains<br>49.07   | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07   | • Table 5<br>• 5), Wat<br>Mar<br>120.59<br>ted in Ap<br>28.25<br>•ulated in<br>257.75<br>ated in Ap  | Apr           120.59           opendix           21.39           Appendix           243.17           opendix           49.07   | ):<br>120.59<br>L, equati<br>15.99<br>dix L, equ<br>224.77<br>L, equat  | Jun<br>120.59<br>on L9 of<br>13.5<br>uation L<br>207.47<br>ion L15  | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)                                  | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se                                  | Sep<br>120.59<br>Table 5<br>25.44<br>9 see Ta<br>200.05<br>ee Table                      | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5                                  | Nov<br>120.59<br>37.7<br>233.03                                  | Dec<br>120.59<br>40.19<br>250.33                                  | leating       | (67)<br>(68)                         |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Applia<br>(68)m=<br>Cookir<br>(69)m=   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>ng gains<br>49.07   | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07   | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> </ul>  | Apr           120.59           opendix           21.39           Appendix           243.17           opendix           49.07   | ):<br>120.59<br>L, equati<br>15.99<br>dix L, equ<br>224.77<br>L, equat  | Jun<br>120.59<br>on L9 of<br>13.5<br>uation L<br>207.47<br>ion L15  | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)                                  | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se                                  | Sep<br>120.59<br>Table 5<br>25.44<br>9 see Ta<br>200.05<br>ee Table                      | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5                                  | Nov<br>120.59<br>37.7<br>233.03                                  | Dec<br>120.59<br>40.19<br>250.33                                  | leating       | (67)<br>(68)                         |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliat<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=                                       | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>ng gains<br>49.07<br>s and far<br>3   | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calcula<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3   | <ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in Ap</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> </ul>   | 5 and 5a<br>ts<br>Apr<br>120.59<br>ppendix<br>21.39<br>Appendix<br>243.17<br>ppendix<br>49.07<br>5a)<br>3  | ):<br>120.59<br>L, equati<br>15.99<br>dix L, equat<br>224.77<br>L, equat<br>49.07                                     | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07                                  | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07                         | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07                         | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>200.05<br>200.05<br>200.05<br>200.05      | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07                         | Nov<br>120.59<br>37.7<br>233.03<br>49.07                         | Dec<br>120.59<br>40.19<br>250.33<br>49.07                         | leating       | (67)<br>(68)<br>(69)                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliat<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=                                       | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>ng gains<br>49.07<br>s and far<br>3   | ains (see<br>s (Table<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calcula<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3   | <ul> <li>Table 5</li> <li>5), Wat</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in Ap</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> </ul>   | 5 and 5a<br>ts<br>Apr<br>120.59<br>ppendix<br>21.39<br>Appendix<br>243.17<br>ppendix<br>49.07<br>5a)<br>3  | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equat<br>224.77<br>L, equat<br>49.07<br>3                         | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07                                  | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07                         | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07                         | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>200.05<br>200.05<br>200.05<br>200.05      | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07                         | Nov<br>120.59<br>37.7<br>233.03<br>49.07                         | Dec<br>120.59<br>40.19<br>250.33<br>49.07                         | leating       | (67)<br>(68)<br>(69)                 |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliau<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=<br>Losses<br>(71)m=                   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>g gains<br>49.07<br>s and fan<br>3<br>s e.g. ev<br>-80.39                     | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3<br>vaporatic   | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation of the second seco</li></ul> | and 5a         ts         Apr         120.59         opendix         21.39         a Append         243.17         opendix         49.07         5a)         3         tive valu                 | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77<br>L, equati<br>49.07<br>3<br>es) (Tab           | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07<br>3<br>le 5)                    | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07<br>3                    | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07                         | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>ee Table<br>49.07                         | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07<br>3                    | Nov<br>120.59<br>37.7<br>233.03<br>49.07<br>3                    | Dec<br>120.59<br>40.19<br>250.33<br>49.07<br>3                    | leating       | (67)<br>(68)<br>(69)<br>(70)         |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Appliau<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=<br>Losses<br>(71)m=                   | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>g gains<br>49.07<br>s and fan<br>3<br>s e.g. ev<br>-80.39                     | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3<br>raporatic<br>-80.39                                 | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation of the second seco</li></ul> | and 5a         ts         Apr         120.59         opendix         21.39         a Append         243.17         opendix         49.07         5a)         3         tive valu                 | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77<br>L, equati<br>49.07<br>3<br>es) (Tab           | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07<br>3<br>le 5)                    | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07<br>3                    | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07                         | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>ee Table<br>49.07                         | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07<br>3                    | Nov<br>120.59<br>37.7<br>233.03<br>49.07<br>3                    | Dec<br>120.59<br>40.19<br>250.33<br>49.07<br>3                    | leating       | (67)<br>(68)<br>(69)<br>(70)         |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Applia<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=<br>Losses<br>(71)m=<br>Water<br>(72)m= | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>g gains<br>49.07<br>s and far<br>3<br>s e.g. ev<br>-80.39<br>heating<br>75.16 | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3<br>raporatic<br>-80.39<br>gains (T                     | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation - 80.39)</li> <li>able 5</li> <li>68.22</li> </ul>   | and 5a         ts         Apr         120.59         opendix         21.39         Appendix         243.17         oppendix         49.07         5a)         3         tive valu         -80.39 | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77<br>L, equati<br>49.07<br>3<br>es) (Tab<br>-80.39 | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07<br>3<br>le 5)<br>-80.39<br>52.84 | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07<br>3<br>-80.39<br>48.69 | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07<br>3<br>-80.39<br>54.57 | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>ee Table<br>49.07<br>3<br>-80.39<br>57.02 | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07<br>3<br>-80.39<br>63.11 | Nov<br>120.59<br>37.7<br>233.03<br>49.07<br>3<br>-80.39          | Dec<br>120.59<br>40.19<br>250.33<br>49.07<br>3<br>-80.39<br>73.28 | leating       | (67)<br>(68)<br>(69)<br>(70)<br>(71) |
| inclu<br>5. Int<br>Metabo<br>(66)m=<br>Lightin<br>(67)m=<br>Applia<br>(68)m=<br>Cookir<br>(69)m=<br>Pumps<br>(70)m=<br>Losses<br>(71)m=<br>Water<br>(72)m= | ernal ga<br>olic gain<br>Jan<br>120.59<br>g gains<br>39.11<br>nces ga<br>261.88<br>g gains<br>49.07<br>s and far<br>3<br>s e.g. ev<br>-80.39<br>heating<br>75.16 | ains (see<br>Feb<br>120.59<br>(calcula<br>34.73<br>ins (calc<br>264.6<br>(calcula<br>49.07<br>ns gains<br>3<br>raporatic<br>-80.39<br>gains (T<br>72.71<br>gains = | <ul> <li>Table 5</li> <li>Mar</li> <li>120.59</li> <li>ted in Ap</li> <li>28.25</li> <li>culated in</li> <li>257.75</li> <li>ated in Ap</li> <li>49.07</li> <li>(Table 5</li> <li>3</li> <li>on (negation - 80.39)</li> <li>able 5</li> <li>68.22</li> </ul>   | and 5a         ts         Apr         120.59         opendix         21.39         Appendix         243.17         oppendix         49.07         5a)         3         tive valu         -80.39 | ):<br>May<br>120.59<br>L, equati<br>15.99<br>dix L, equati<br>224.77<br>L, equati<br>49.07<br>3<br>es) (Tab<br>-80.39 | Jun<br>120.59<br>ion L9 of<br>13.5<br>uation L<br>207.47<br>ion L15<br>49.07<br>3<br>le 5)<br>-80.39<br>52.84 | Jul<br>120.59<br>r L9a), a<br>14.58<br>13 or L1<br>195.92<br>or L15a)<br>49.07<br>3<br>-80.39<br>48.69 | Aug<br>120.59<br>Iso see<br>18.96<br>3a), also<br>193.2<br>, also se<br>49.07<br>3<br>-80.39<br>54.57 | Sep<br>120.59<br>Table 5<br>25.44<br>200.05<br>ee Table<br>49.07<br>3<br>-80.39<br>57.02 | Oct<br>120.59<br>32.3<br>ble 5<br>214.63<br>5<br>49.07<br>3<br>-80.39<br>63.11 | Nov<br>120.59<br>37.7<br>233.03<br>49.07<br>3<br>-80.39<br>69.92 | Dec<br>120.59<br>40.19<br>250.33<br>49.07<br>3<br>-80.39<br>73.28 | leating       | (67)<br>(68)<br>(69)<br>(70)<br>(71) |

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



| Orientation | n: Access F<br>Table 6d | actor | Area<br>m² |   | Flux<br>Table 6a |   | g_<br>Table 6b |   | FF<br>Table 6c |   | Gains<br>(W) |      |
|-------------|-------------------------|-------|------------|---|------------------|---|----------------|---|----------------|---|--------------|------|
| North (     | ).9x 0.77               | x     | 7.98       | x | 10.63            | × | 0.57           | x | 0.7            | = | 23.46        | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 20.32            | x | 0.57           | x | 0.7            | = | 44.84        | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 34.53            | x | 0.57           | x | 0.7            | = | 76.19        | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 55.46            | x | 0.57           | x | 0.7            | = | 122.38       | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 74.72            | x | 0.57           | x | 0.7            | = | 164.86       | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 79.99            | x | 0.57           | x | 0.7            | = | 176.49       | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 74.68            | x | 0.57           | x | 0.7            | = | 164.78       | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 59.25            | x | 0.57           | x | 0.7            | = | 130.73       | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 41.52            | x | 0.57           | x | 0.7            | = | 91.61        | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 24.19            | × | 0.57           | x | 0.7            | = | 53.37        | (74) |
| North (     | ).9x 0.77               | X     | 7.98       | x | 13.12            | × | 0.57           | x | 0.7            | = | 28.94        | (74) |
| North (     | ).9x 0.77               | x     | 7.98       | x | 8.86             | × | 0.57           | x | 0.7            | = | 19.56        | (74) |
| South (     | ).9x 0.77               | x     | 12.18      | x | 46.75            | × | 0.57           | x | 0.7            | = | 157.45       | (78) |
| South (     | ).9x 0.77               | X     | 12.18      | x | 76.57            | × | 0.57           | x | 0.7            | = | 257.87       | (78) |
| South (     | ).9x 0.77               | x     | 12.18      | x | 97.53            | × | 0.57           | x | 0.7            | = | 328.48       | (78) |
| South (     | ).9x 0.77               | X     | 12.18      | x | 110.23           | x | 0.57           | x | 0.7            | = | 371.25       | (78) |
| South (     | ).9x 0.77               | X     | 12.18      | x | 114.87           | x | 0.57           | x | 0.7            | = | 386.87       | (78) |
| South (     | ).9x 0.77               | x     | 12.18      | x | 110.55           | x | 0.57           | x | 0.7            | = | 372.31       | (78) |
| South (     | ).9x 0.77               | x     | 12.18      | x | 108.01           | x | 0.57           | x | 0.7            | = | 363.77       | (78) |
| South (     | ).9x 0.77               | x     | 12.18      | x | 104.89           | x | 0.57           | x | 0.7            | = | 353.27       | (78) |
| South (     | ).9x 0.77               | x     | 12.18      | x | 101.89           | x | 0.57           | x | 0.7            | = | 343.14       | (78) |
| South (     | ).9x 0.77               | X     | 12.18      | x | 82.59            | x | 0.57           | x | 0.7            | = | 278.14       | (78) |
| South (     | ).9x 0.77               | X     | 12.18      | x | 55.42            | x | 0.57           | x | 0.7            | = | 186.64       | (78) |
| South (     | ).9x 0.77               | X     | 12.18      | x | 40.4             | × | 0.57           | x | 0.7            | = | 136.05       | (78) |
| West (      | ).9x 0.77               | X     | 4.2        | x | 19.64            | x | 0.57           | x | 0.7            | = | 22.81        | (80) |
| West (      | ).9x 0.77               | x     | 4.2        | x | 38.42            | x | 0.57           | x | 0.7            | = | 44.62        | (80) |
| West (      | ).9x 0.77               | x     | 4.2        | x | 63.27            | x | 0.57           | x | 0.7            | = | 73.48        | (80) |
| West (      | ).9x 0.77               | x     | 4.2        | x | 92.28            | x | 0.57           | x | 0.7            | = | 107.17       | (80) |
| West (      | ).9x 0.77               | x     | 4.2        | x | 113.09           | x | 0.57           | x | 0.7            | = | 131.34       | (80) |
| West (      | ).9x 0.77               | X     | 4.2        | x | 115.77           | × | 0.57           | x | 0.7            | = | 134.45       | (80) |
| West (      | ).9x 0.77               | X     | 4.2        | x | 110.22           | × | 0.57           | x | 0.7            | = | 128          | (80) |
| West (      | ).9x 0.77               | X     | 4.2        | x | 94.68            | × | 0.57           | x | 0.7            | = | 109.95       | (80) |
| West (      | ).9x 0.77               | x     | 4.2        | x | 73.59            | × | 0.57           | x | 0.7            | = | 85.46        | (80) |
| West (      | ).9x 0.77               | X     | 4.2        | x | 45.59            | × | 0.57           | x | 0.7            | = | 52.94        | (80) |
| West (      | ).9x 0.77               | x     | 4.2        | x | 24.49            | × | 0.57           | x | 0.7            | = | 28.44        | (80) |
| West (      | ).9x 0.77               | x     | 4.2        | x | 16.15            | × | 0.57           | x | 0.7            | = | 18.76        | (80) |

| Solar g | Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m |           |           |                      |           |         |         |        |        |        |        |        |      |
|---------|---|-----------|-----------|----------------------|-----------|---------|---------|--------|--------|--------|--------|--------|------|
| (83)m=  | 203.73  | 347.33    | 478.15    | 600.8                | 683.07    | 683.25  | 656.54  | 593.95 | 520.2  | 384.46 | 244.02 | 174.37 | (83) |
| Total g | ains – iı   | nternal a | ind solar | <sup>-</sup> (84)m = | = (73)m - | + (83)m | , watts |        |        |        |        |        | -    |
| (84)m=  | 672.14  | 811.63    | 924.63    | 1019.94              | 1074.37   | 1049.32 | 1008    | 952.94 | 894.98 | 786.76 | 676.94 | 630.43 | (84) |





| emperatu  | re during h  | neating p  | eriods ir   | n the livir  | ng area   | from 1 at   | ole 9, Th   | 1 (°C)   |   |  |   | 21                         | (85  |
|---|--|--|---|--|---|---|---|--|---|--|---|----------------------------|--|
| tilisation f  | actor for g  | ains for   | living are  | ea, h1,m   | (see Ta   | ble 9a)   | _   | -  | -   |  |   |                            |  |
| Jar   | Feb  | Mar  | Apr   | May  | Jun   | Jul   | Aug   | Sep  | Oct   | Nov  | Dec   |                            |  |
| )m= 0.91  | 0.86   | 0.81   | 0.72  | 0.61   | 0.48  | 0.36  | 0.4   | 0.56   | 0.75  | 0.87   | 0.92  |                            | (86  |
| lean interi   | nal tempei   | ature in   | living ar   | ea T1 (fo  | ollow ste   | ps 3 to 7   | 7 in Tabl   | e 9c)  |   |  |   |                            |  |
| )m= 18.53   | 3 18.92  | 19.44  | 20.02   | 20.48  | 20.79   | 20.92   | 20.9  | 20.68  | 20.06   | 19.2   | 18.46   |                            | (87  |
| emperatu  | re during l  | neating p  | beriods ir  | n rest of  | dwelling  | from Ta   | able 9. T   | h2 (°C)  |   |  |   |                            |  |
| )m= 19.60   |  | 19.67  | 19.68   | 19.69  | 19.7  | 19.7  | 19.7  | 19.69  | 19.69   | 19.68  | 19.67   |                            | (8   |
| tilisation f  | actor for g  | ains for   | rest of d   | welling  | h2 m (se  | e Table   | .9a)  |  |   |  |   |                            |  |
| )m= 0.89  |  | 0.78   | 0.68  | 0.55   | 0.4   | 0.27  | 0.3   | 0.49   | 0.71  | 0.85   | 0.9   |                            | (8   |
| Leon inter  | nal temper   | ı<br>əture in  | the rest  | of dwelli  | na T2 (f  | l<br>ollow ste  | ne 3 to .   | I<br>7 in Tabl   |   |  |   |                            |  |
| )m= 17.49   |  | 18.36  | 18.91   | 19.32  | 19.58   | 19.67   | 19.66   | 19.5   | 18.97   | 18.16  | 17.43   |                            | (9   |
| ,   |  |  |   |  |   |   |   |  |   | g area ÷ (4  | 4) =  | 0.41                       | (9   |
|   |  |  | and a f   |  | ()<br>()  | · • • • •   | . (4 . 0  |  |   |  | Ĺ   | 0.11                       |  |
|   | 18.3 18.3  | 18.8   | 19.36   | ole dwe  | lling) = f<br>20.08   | LA × 11<br>20.18  | + (1 – fL<br>20.17  | A) × 12<br>19.98   | 19.42   | 18.59  | 17.85   |                            | (9   |
| ·   | stment to t  |  |   |  |   |   |   |  |   | 10.59  | 17.00   |                            | (0   |
| )m= 17.92   | -  | 18.8   | 19.36   | 19.8   | 20.08   | 20.18   | 20.17   | 19.98  | 19.42   | 18.59  | 17.85   |                            | (9   |
| ·   |  |  |   |  | _0.00   | _00   |   |  |   |  |   |                            |  |
| Snace h   | pating reg   | uirement   |   |  |   |   |   |  |   |  |   |                            |  |
|   |  |  |   | e obtoin   |   | am 11 af  | Table O   | h  | 4 T: ('   | 70)  |   | vlete                      |  |
| et Ti to th   | e mean in  | ternal ter   | mperatu   |  | ied at st   | ep 11 of  | Table 9   | b, so tha  | it Ti,m=(   | 76)m an  | d re-calc   | ulate                      |  |
| et Ti to th   | e mean in<br>on factor fe  | ternal ter   | mperatu   |  | ied at sto  | ep 11 of<br>Jul   | Table 9   | b, so tha<br>Sep   | it Ti,m=(<br>Oct  | 76)m an<br>Nov   | d re-calc   | ulate                      |  |
| et Ti to th<br>e utilisatio<br>Jar  | e mean in<br>on factor fe  | ternal ter<br>or gains<br>Mar  | mperatu<br>using Ta<br>Apr  | ble 9a   | ·   |   | 1   |  |   | ,  |   | ulate                      |  |
| et Ti to the utilisation<br>Jar<br>tilisation f   | e mean in<br>on factor f<br>Feb<br>actor for g   | ternal ter<br>or gains<br>Mar  | mperatu<br>using Ta<br>Apr  | ble 9a   | ·   |   | 1   |  |   | ,  |   | ulate                      | (9   |
| et Ti to the<br>ne utilisatio<br>Jar<br>tilisation f<br>)m= 0.87  | e mean in<br>on factor f<br>Feb<br>actor for g   | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76  | mperatur<br>using Ta<br>Apr<br>i:<br>0.67   | ble 9a<br>May<br>0.56  | Jun   | Jul   | Aug   | Sep  | Oct   | Nov  | Dec   | ulate                      | (9   |
| et Ti to the<br>ne utilisatio<br>Jar<br>tilisation f<br>)m= 0.87<br>seful gain  | e mean in<br>on factor fo<br>Feb<br>actor for g<br>0.82<br>s, hmGm   | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76  | mperatur<br>using Ta<br>Apr<br>i:<br>0.67   | ble 9a<br>May<br>0.56  | Jun   | Jul   | Aug   | Sep  | Oct   | Nov  | Dec   | ulate                      | ``   |
| et Ti to the<br>ne utilisation<br>tilisation f<br>)m= 0.87<br>seful gain<br>)m= 583.3<br>lonthly av   | e mean in<br>on factor fo<br>Feb<br>actor for g<br>0.82<br>s, hmGm   | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem  | mperatur<br>using Ta<br>Apr<br>:<br>0.67<br>4)m x (8-<br>682.87<br>perature   | ble 9a<br>May<br>0.56<br>4)m<br>597.85   | Jun<br>0.42<br>442.66   | Jul<br>0.3  | Aug<br>0.33   | Sep<br>0.5   | Oct 0.7   | Nov<br>0.83  | Dec   | ulate                      | (9   |
| et Ti to the<br>e utilisation<br>tilisation f<br>)m= 0.87<br>seful gain<br>)m= 583.3<br>lonthly av<br>)m= 4.3   | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9  | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5   | mperatur<br>using Ta<br>Apr<br>:<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9  | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>9 from Ta<br>11.7  | Jun<br>0.42<br>442.66<br>able 8<br>14.6   | Jul<br>0.3<br>306.45<br>16.6  | Aug<br>0.33<br>317.94<br>16.4   | Sep<br>0.5<br>451.24<br>14.1   | Oct<br>0.7<br>550.49<br>10.6  | Nov<br>0.83  | Dec   | ulate                      | (9   |
| et Ti to the<br>e utilisation f<br>Jar<br>tilisation f<br>)m= $0.87$<br>seful gain<br>)m= $583.3$<br>lonthly av<br>)m= $4.3$<br>eat loss ra   | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me  | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern  | mperatur<br>using Ta<br>Apr<br>1:<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe  | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature,  | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =                                       | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m   | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m   | Sep<br>0.5<br>451.24<br>14.1<br>– (96)m  | Oct<br>0.7<br>550.49<br>10.6<br>]   | Nov<br>0.83<br>558.66<br>7.1                             | Dec<br>0.88<br>554.93<br>4.2                      | ulate                      | (9<br>(9   |
| et Ti to the utilisation f<br>illisation f<br>m = 0.87<br>seful gain<br>m = 583.3<br>lonthly av<br>m = 4.3<br>eat loss ra<br>m = 1274.3   | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67  | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49   | mperatur<br>using Ta<br>Apr<br>:<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61   | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature, 1<br>741.51  | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78                             | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m<br>324.03                                 | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26   | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8   | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52                                     | Nov<br>0.83<br>558.66<br>7.1<br>1057.11                  | Dec<br>0.88<br>554.93                             | ulate                      | (9<br>(9   |
| et Ti to the<br>e utilisation<br>tilisation f<br>)m= 0.87<br>seful gain<br>)m= 583.3<br>lonthly av<br>)m= 4.3<br>eat loss ra<br>)m= 1274.3<br>pace heat   | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67  | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo   | mperatur<br>using Ta<br>Apr<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61<br>pr each n   | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature,<br>741.51<br>nonth, k\   | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon                   | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m<br>324.03<br>th = 0.02                    | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97  | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8<br>)m - (95   | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>)m] x (4                         | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m           | Dec<br>0.88<br>554.93<br>4.2<br>1263.38           | ulate                      | (9<br>(9   |
| et Ti to the<br>e utilisation<br>tilisation f<br>)m= 0.87<br>seful gain<br>)m= 583.3<br>lonthly av<br>)m= 4.3<br>eat loss ra<br>)m= 1274.3<br>pace heat   | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67  | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49   | mperatur<br>using Ta<br>Apr<br>:<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61   | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature, 1<br>741.51  | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78                             | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m<br>324.03                                 | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97<br>0                                   | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8<br>)m - (95<br>0                                    | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>6)m] x (4<br>191.23              | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 |                            | (9<br>(9<br>(9   |
| et Ti to the<br>ne utilisation<br>(Jar<br>(tilisation f<br>)m= $0.87$<br>(seful gain<br>)m= $583.3$<br>(lonthly av<br>)m= $4.3$<br>(leat loss ra<br>)m= $1274.3$<br>pace heat<br>)m= $514.2$  | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67<br>ting requir<br>4 393.12   | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo<br>329.64   | mperatur<br>using Ta<br>Apr<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61<br>or each n<br>199.97   | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature, 1<br>741.51<br>nonth, kV<br>106.89   | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon                   | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m<br>324.03<br>th = 0.02                    | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97<br>0                                   | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8<br>)m - (95   | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>6)m] x (4<br>191.23              | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 | ulate<br>2621.05           | (9<br>(9<br>(9   |
| et Ti to the<br>ne utilisation<br>(Jar<br>(tilisation f<br>)m= $0.87$<br>(seful gain<br>)m= $583.3$<br>(lonthly av<br>)m= $4.3$<br>(leat loss ra<br>)m= $1274.3$<br>pace heat<br>)m= $514.2$  | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67  | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo<br>329.64   | mperatur<br>using Ta<br>Apr<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61<br>or each n<br>199.97   | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature, 1<br>741.51<br>nonth, kV<br>106.89   | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon                   | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m<br>324.03<br>th = 0.02                    | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97<br>0                                   | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8<br>)m - (95<br>0                                    | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>6)m] x (4<br>191.23              | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 |                            | (9<br>(9<br>(9   |
| he utilisation<br>Jar<br>Jar<br>Julisation f<br>m = 0.87<br>Joseful gain<br>m = 583.3<br>Jonthly av<br>m = 4.3<br>Jeat loss ra<br>m = 1274.3<br>pace heat<br>m = 514.2<br>pace heat   | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67<br>ting requir<br>4 393.12   | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo<br>329.64<br>ement in                                       | mperatur<br>using Ta<br>Apr<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61<br>or each n<br>199.97   | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature,<br>741.51<br>nonth, kV<br>106.89   | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon<br>0              | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m<br>324.03<br>th = 0.02<br>0               | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97<br>0<br>Tota                           | Sep<br>0.5<br>451.24<br>14.1<br>– (96)m<br>534.8<br>)m – (95<br>0<br>Il per year                     | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>6)m] x (4<br>191.23              | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 | 2621.05                    | (9)<br>(9)<br>(9)  |
| et Ti to the<br>e utilisation<br>filisation f<br>m = 0.87<br>seful gain<br>m = 583.3<br>lonthly av<br>m = 4.3<br>eat loss ra<br>m = 1274.3<br>pace heat<br>m = 514.2<br>pace heat<br>. Energy r   | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67<br>ting requir<br>4 393.12<br>ting requir<br>equirement<br>ting:             | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo<br>329.64<br>ement in<br>hts - Ind                          | mperatur<br>using Ta<br>Apr<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61<br>r each n<br>199.97<br>kWh/m <sup>2</sup><br>ividual h                                       | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature,<br>741.51<br>nonth, k\<br>106.89<br>2/year<br>eating sy                                  | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon <sup>-</sup><br>0 | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m 2<br>324.03<br>th = 0.02<br>0<br>ncluding | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97)<br>0<br>Tota<br>micro-C               | Sep<br>0.5<br>451.24<br>14.1<br>– (96)m<br>534.8<br>)m – (95<br>0<br>Il per year                     | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>6)m] x (4<br>191.23              | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 | 2621.05<br>42.97           | (9<br>(9<br>(9<br>(9<br>(9   |
| et Ti to the<br>e utilisation f<br>jm= $0.87$<br>seful gain<br>m= $583.3$<br>lonthly av<br>m= $4.3$<br>eat loss range<br>m= $1274.1$<br>pace heat<br>m= $514.2$<br>pace heat<br>space heat<br>m= $514.2$  | e mean im<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67<br>ing requir<br>4 393.12<br>ing requir<br>equirement<br>ting:<br>space hea  | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo<br>329.64<br>ement in<br>hts - Indi                         | mperatur<br>using Ta<br>Apr<br>1:<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61<br>r each n<br>199.97<br>kWh/m <sup>2</sup><br>ividual h                                 | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature,<br>741.51<br>nonth, k\<br>106.89<br>2/year<br>eating sy<br>y/supple                      | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon <sup>-</sup><br>0 | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m<br>324.03<br>th = 0.02<br>0<br>ncluding   | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97<br>0<br>Tota<br>micro-C                | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8<br>)m - (95<br>0<br>1 per year<br>CHP)              | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>6)m] x (4<br>191.23              | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 | 2621.05                    | (9<br>(9<br>(9<br>(9<br>(9<br>(9                                   |
| et Ti to the<br>e utilisation<br>filisation f<br>)m= $0.87$<br>seful gain<br>)m= $583.3$<br>lonthly av<br>)m= $4.3$<br>eat loss ra<br>)m= $1274.3$<br>pace heat<br>)m= $514.2$<br>pace heat<br>. Energy r<br>pace heat<br>raction of<br>raction of  | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67<br>ing requir<br>4 393.12<br>ing requir<br>equirement<br>ting:<br>space heat | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo<br>329.64<br>ement in<br>hts - Ind<br>at from so            | mperatur<br>using Ta<br>Apr<br>1:<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>al tempe<br>960.61<br>r each n<br>199.97<br>kWh/m <sup>2</sup><br>ividual h<br>econdar<br>nain syst          | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature, 1<br>741.51<br>nonth, k\<br>106.89<br>c/year<br>eating sy<br>y/supple<br>em(s)           | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon <sup>-</sup><br>0 | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m :<br>324.03<br>th = 0.02<br>0<br>ncluding | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97<br>0<br>Tota<br>micro-C<br>(202) = 1 · | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8<br>)m - (95<br>0<br>1 per year<br>CHP)<br>- (201) = | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>i)m] x (4<br>191.23<br>(kWh/year | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 | 2621.05<br>42.97           | (9<br>(9<br>(9<br>(9<br>(9<br>(9<br>(9<br>(2<br>(2                 |
| et Ti to the<br>ne utilisation<br>(Jar<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(J | e mean im<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67<br>ing requir<br>4 393.12<br>ing requir<br>equirement<br>ting:<br>space hea  | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo<br>329.64<br>ement in<br>hts - Ind<br>at from so            | mperatur<br>using Ta<br>Apr<br>1:<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>al tempe<br>960.61<br>r each n<br>199.97<br>kWh/m <sup>2</sup><br>ividual h<br>econdar<br>nain syst          | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature, 1<br>741.51<br>nonth, k\<br>106.89<br>c/year<br>eating sy<br>y/supple<br>em(s)           | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon <sup>-</sup><br>0 | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m :<br>324.03<br>th = 0.02<br>0<br>ncluding | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97<br>0<br>Tota<br>micro-C                | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8<br>)m - (95<br>0<br>1 per year<br>CHP)<br>- (201) = | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>i)m] x (4<br>191.23<br>(kWh/year | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 | 2621.05<br>42.97<br>0      | (9<br>(9<br>(9<br>(9<br>(9<br>(9<br>(9<br>(2<br>(2                 |
| et Ti to the<br>ne utilisation<br>(Jar<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(Jar)<br>(J | e mean in<br>on factor for<br>actor for g<br>0.82<br>s, hmGm<br>5 665.67<br>erage exte<br>4.9<br>ate for me<br>54 1250.67<br>ing requir<br>4 393.12<br>ing requir<br>equirement<br>ting:<br>space heat | ternal ter<br>or gains<br>Mar<br>ains, hm<br>0.76<br>, W = (94<br>701.43<br>ernal tem<br>6.5<br>an intern<br>1144.49<br>ement fo<br>329.64<br>ement in<br>at from so<br>at from r<br>ng from | mperatur<br>using Ta<br>Apr<br>0.67<br>4)m x (8-<br>682.87<br>perature<br>8.9<br>nal tempe<br>960.61<br>or each n<br>199.97<br>kWh/m <sup>2</sup><br>ividual h<br>econdar<br>nain syst<br>main syst | ble 9a<br>May<br>0.56<br>4)m<br>597.85<br>e from Ta<br>11.7<br>erature, 1<br>741.51<br>nonth, kV<br>106.89<br>?/year<br>eating sy<br>y/supple<br>em(s)<br>stem 1 | Jun<br>0.42<br>442.66<br>able 8<br>14.6<br>Lm , W =<br>495.78<br>Wh/mon <sup>-</sup><br>0 | Jul<br>0.3<br>306.45<br>16.6<br>=[(39)m :<br>324.03<br>th = 0.02<br>0<br>ncluding | Aug<br>0.33<br>317.94<br>16.4<br>x [(93)m<br>340.26<br>24 x [(97<br>0<br>Tota<br>micro-C<br>(202) = 1 · | Sep<br>0.5<br>451.24<br>14.1<br>- (96)m<br>534.8<br>)m - (95<br>0<br>1 per year<br>CHP)<br>- (201) = | Oct<br>0.7<br>550.49<br>10.6<br>]<br>807.52<br>i)m] x (4<br>191.23<br>(kWh/year | Nov<br>0.83<br>558.66<br>7.1<br>1057.11<br>1)m<br>358.88 | Dec<br>0.88<br>554.93<br>4.2<br>1263.38<br>527.08 | 2621.05<br>42.97<br>0<br>1 | (9)<br>(9)<br>(9)<br>(9)<br>(9)<br>(9)<br>(9)<br>(9)<br>(9)<br>(9) |

thermenergy



|  | Jan   | Feb   | Mar  | Apr   | May                   | Jun   | Jul   | Aug       | Sep             | Oct   | Nov  | Dec  | kWh/yea   | ar   |
|--|---|---|--|---|-----------------------|---|---|-----------|-----------------|---|--|--|---|--|
| Space  | e heating   | g require   | ement (c   | alculated                                       | d above)              | )   |   |           |                 |   |  |  | -   |  |
|  | 514.24  | 393.12  | 329.64   | 199.97  | 106.89                | 0   | 0   | 0         | 0               | 191.23  | 358.88   | 527.08   |   |  |
| (211)m   |   |   | 1  | 00 ÷ (20  | ,<br>                 |   |   | -         |                 |   |  |  | 1   | (211)  |
|  | 579.1   | 442.7   | 371.21   | 225.19  | 120.37                | 0   | 0   | 0<br>Tota | 0<br>I (kWh/yea | 215.35  | 404.15   | 593.56   | 0054.00   | 7(214)   |
| Space  | - hoatin  | a fuol (e   | ocondar  | y), kWh/  | month                 |   |   | TOTA      | ii (Kwii/yee    |   | 15,1012  | <u></u>  | 2951.63   | (211)  |
| •  |   |   | econdar<br>00 ÷ (20  | • •   | monun                 |   |   |           |                 |   |  |  |   |  |
| (215)m=  | 0   | 0   | 0  | 0   | 0                     | 0   | 0   | 0         | 0               | 0   | 0  | 0  | ]   |  |
| I  |   |   |  |   |                       |   |   | Tota      | l (kWh/yea      | ar) =Sum(2  | 215) <sub>15,1012</sub>                              | =  | 0   | (215)  |
| Water  | heating   | l   |  |   |                       |   |   |           |                 |   |  |  |   | -  |
| Output   | from wa   | ater hea<br>156.87  | ter (calc<br>163.21  | ulated at<br>144.76                             | oove)<br>140.15       | 123.44  | 118.26  | 131.84    | 133.29          | 151.78  | 162.02   | 175.36   | 1   |  |
| Efficier   | ncy of wa   |   |  | 144.70  | 140.13                | 123.44  | 110.20  | 131.04    | 155.29          | 131.70  | 102.02   | 175.50   | 79.5  | (216)  |
| (217)m=  | · ·   | 85.93   | 85.49  | 84.64   | 83.27                 | 79.5  | 79.5  | 79.5      | 79.5            | 84.43   | 85.68  | 86.28  |   | (217)  |
| Fuel fo  | r water l   | heating,  | kWh/mo   | onth  |                       |   | 1   |           |                 |   | 1  | 1  | 1   |  |
| (219)m   |   | <u>m x 100</u><br>182.55  | ) ÷ (217)<br>190.92  | m<br>171.03                                     | 168.3                 | 155.27  | 148.76  | 165.83    | 167.66          | 179.77  | 189.1  | 203.25   | 1   |  |
| (219)11=   | 200.55  | 102.55  | 190.92   | 171.03  | 100.5                 | 155.27  | 140.70  |           | I = Sum(2       |   | 109.1  | 203.23   | 2130.78   | (219)  |
| Annua  | l totals  |   |  |   |                       |   |   |           |                 |   | Wh/year  |  | kWh/year  |  |
| Space  | heating   | fuel use  | ed, main   | system  | 1                     |   |   |           |                 |   |  |  | 2951.63   | ]  |
| Water  | heating   | fuel use  | d  |   |                       |   |   |           |                 |   |  |  | 2130.78   | Ī  |
| Electric   | city for p  | umps, fa  | ans and  | electric l                                      | keep-hot              | t   |   |           |                 |   |  |  |   | -  |
|  |   | -   |  |   |                       | -   |   |           |                 |   |  |  |   |  |
| centra   | al heatin   | g pump:   | :  |   |                       | -   |   |           |                 |   |  | 30   | ]   | (230c)   |
|  | al heatin<br>with a fa  |   |  |   |                       | -   |   |           |                 |   |  | 30<br>45   | ]   | (230c)<br>(230e)   |
| boiler   | with a fa   | an-assis  | sted flue  | ⟨Wh/yea   | ·                     | -   |   | sum       | of (230a).      | (230g) =  |  |  | ]<br>]<br>  |  |
| boiler<br>Total e  | with a fa   | an-assis  | sted flue  |   | ·                     | -   |   | sum       | of (230a).      | (230g) =  |  |  | 75  | (230e)   |
| boiler<br>Total e<br>Electric  | with a fa   | an-assis<br>v for the<br>ghting   | sted flue<br>above, l  |   | ·                     | -   |   | sum       | of (230a).      | (230g) =  |  |  |   | (230e)<br>](231)   |
| boiler<br>Total e<br>Electric<br>Electric  | with a fa<br>lectricity<br>city for lig<br>city gene  | an-assis<br>for the<br>ghting<br>erated by  | sted flue<br>above, ł<br>y PVs   |   | r                     |   | + (232).  |           |                 | (230g) =  |  |  | 276.25  | (230e)<br>(231)<br>(232)   |
| boiler<br>Total e<br>Electric<br>Electric<br>Total d   | with a fa<br>lectricity<br>city for li-<br>city gene<br>lelivered   | an-assis<br>v for the<br>ghting<br>erated by<br>energy  | sted flue<br>above, l<br>y PVs<br>for all u  | ⟨Wh/yea   | r<br>)(221)           |   | + (232).  |           |                 | (230g) =  |  |  | 276.25  | (230e)<br>(231)<br>(232)<br>(233)  |
| boiler<br>Total e<br>Electric<br>Electric<br>Total d   | with a fa<br>lectricity<br>city for li-<br>city gene<br>lelivered   | an-assis<br>v for the<br>ghting<br>erated by<br>energy  | sted flue<br>above, l<br>y PVs<br>for all u  | ⟨Wh/yea<br>ses (211                             | r<br>)(221)           | + (231)   |   |           |                 |   |  |  | 276.25<br>-760.49<br>4673.17  | (230e)<br>(231)<br>(232)<br>(233)  |
| boiler<br>Total e<br>Electric<br>Electric<br>Total d   | with a fa<br>lectricity<br>city for li-<br>city gene<br>lelivered   | an-assis<br>v for the<br>ghting<br>erated by<br>energy  | sted flue<br>above, l<br>y PVs<br>for all u  | ⟨Wh/yea<br>ses (211                             | r<br>)(221)           | + (231)<br><b>Fu</b>  |   |           |                 | (230g) =<br><b>Fuel P</b><br>(Table   | rice   |  | 276.25  | (230e)<br>(231)<br>(232)<br>(233)  |
| boiler<br>Total e<br>Electric<br>Total d<br>10a. F   | with a fa<br>lectricity<br>city for lig<br>city gene<br>lelivered<br>Fuel cos   | an-assis<br>v for the<br>ghting<br>erated by<br>energy<br>ts - indiv  | sted flue<br>above, l<br>y PVs<br>for all u  | ⟨Wh/yea<br>ses (211<br>eating sy                | r<br>)(221)           | + (231)<br><b>Fu</b><br>kW  | el  |           |                 | Fuel P  | r <b>ice</b><br>12)                                  |  | 276.25<br>-760.49<br>4673.17  | (230e)<br>(231)<br>(232)<br>(233)  |
| boiler<br>Total e<br>Electric<br>Total d<br>10a. F   | with a fa<br>lectricity<br>city for lif<br>city gene<br>lelivered<br>Fuel cos<br>heating  | an-assis<br>v for the<br>ghting<br>erated by<br>energy<br>ts - indiv  | above, I<br>above, I<br>y PVs<br>for all u<br>vidual he  | <wh yea<br="">ses (211<br/>eating sy</wh>       | r<br>)(221)           | + (231)<br><b>Fu</b><br>kW<br>(211                                  | <b>el</b><br>/h/year  |           |                 | Fuel P<br>(Table  | rice<br>12)  | 45   | 276.25<br>-760.49<br>4673.17<br><b>Fuel Cost</b><br>£/year  | (230e)<br>](231)<br>](232)<br>](233)<br>](338)   |
| boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space   | with a fa<br>lectricity<br>city for lif<br>city gene<br>lelivered<br>Fuel cos<br>heating  | an-assis<br>y for the<br>ghting<br>erated by<br>energy<br>ts - indiv<br>ts - indiv  | sted flue<br>above, F<br>y PVs<br>for all us<br>vidual he<br>system 1<br>system 2                                    | <wh yea<br="">ses (211<br/>eating sy</wh>       | r<br>)(221)           | + (231)<br>Fu<br>kW<br>(21)<br>(21)                                 | <b>el</b><br>/h/year<br>1) x                                  |           |                 | Fuel P<br>(Table  | <b>rice</b><br>12)                                   | 45<br>× 0.01 =   | 276.25<br>-760.49<br>4673.17<br><b>Fuel Cost</b><br>£/year<br>102.72                                  | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](240)   |
| boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space<br>Space  | with a fa<br>lectricity<br>city for life<br>city generation<br>lelivered<br>Fuel cos<br>heating<br>heating<br>heating                               | an-assis<br>y for the<br>ghting<br>erated by<br>l energy<br>ts - indiv<br>- main s<br>- main s<br>- secon   | sted flue<br>above, F<br>y PVs<br>for all us<br>vidual he<br>system 1<br>system 2                                    | <wh yea<br="">ses (211<br/>eating sy</wh>       | r<br>)(221)           | + (231)<br>Fu<br>kW<br>(21)<br>(21)                                 | <b>el</b><br>/h/year<br>1) x<br>3) x<br>5) x                  |           |                 | Fuel P<br>(Table  | <b>rice</b><br>12)<br><sup>18</sup>                  | 45<br>x 0.01 =<br>x 0.01 =   | 276.25<br>-760.49<br>4673.17<br><b>Fuel Cost</b><br>£/year<br>102.72<br>0                             | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](338)<br>](240)<br>](241)   |
| boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space<br>Space<br>Water                                 | with a fa<br>lectricity<br>city for life<br>city gene<br>lelivered<br><b>-uel cos</b><br>heating<br>heating<br>heating                              | an-assis<br>y for the<br>ghting<br>erated by<br>l energy<br>ts - indiv<br>- main s<br>- main s<br>- secon<br>cost (oth                                      | sted flue<br>above, f<br>y PVs<br>for all us<br>vidual he<br>system 1<br>system 2<br>dary                            | <wh yea<br="">ses (211<br/>eating sy</wh>       | r<br>)(221)           | + (231)<br>Fu<br>kW<br>(21)<br>(21)<br>(21)                         | el<br>/h/year<br>1) x<br>3) x<br>5) x<br>9)                   |           |                 | <b>Fuel P</b><br>(Table<br>3.4<br>0<br>13.  | <b>Price</b><br>12)<br>8                             | 45<br>x 0.01 =<br>x 0.01 =<br>x 0.01 =   | 276.25<br>-760.49<br>4673.17<br><b>Fuel Cost</b><br>£/year<br>102.72<br>0<br>0                        | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](338)<br>](240)<br>](241)<br>](242)                               |
| boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space<br>Space<br>Water<br>Pumps<br>(if off-p           | with a fa<br>lectricity<br>city for life<br>city gene<br>lelivered<br>Fuel cos<br>heating<br>heating<br>heating<br>a, fans an<br>peak tarif         | an-assis<br>y for the<br>ghting<br>erated by<br>l energy<br>ts - indiv<br>- main s<br>- main s<br>- secon<br>cost (oth<br>nd elect<br>ff, list ea           | sted flue<br>above, l<br>y PVs<br>for all u<br>vidual he<br>system 2<br>dary<br>her fuel)<br>ric keep                | <wh yea<br="">ses (211<br/>eating sy<br/>?</wh> | r<br>)(221)<br>stems: | + (231)<br>Fu<br>kW<br>(21)<br>(21)<br>(21)<br>(21)<br>(21)<br>(23) | el<br>/h/year<br>1) x<br>3) x<br>5) x<br>9)<br>1)<br>y as app | (237b)    | =               | Fuel P         (Table         3.4         0         13.         3.4         13.         13.         13.         13.         13. | rice<br>12)<br><sup>18</sup><br>19<br>19<br>19<br>19 | <ul> <li>45</li> <li>45</li> <li>x 0.01 =</li> <li>rding to</li> </ul> | 276.25<br>-760.49<br>4673.17<br>Fuel Cost<br>£/year<br>102.72<br>0<br>0<br>74.15<br>9.89<br>Table 12a | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](338)<br>](240)<br>](240)<br>](241)<br>](242)<br>](247)<br>](249) |
| boiler<br>Total e<br>Electric<br>Total d<br>10a. F<br>Space<br>Space<br>Space<br>Water<br>Pumps<br>(if off-p<br>Energy | with a fa<br>lectricity<br>city for life<br>city gene<br>lelivered<br><b>-uel cos</b><br>heating<br>heating<br>heating<br>a, fans an<br>peak tarify | an-assis<br>y for the<br>ghting<br>erated by<br>l energy<br>ts - indiv<br>- main s<br>- main s<br>- secon<br>cost (othe<br>nd elect<br>ff, list eat<br>ting | above, F<br>above, F<br>y PVs<br>for all us<br>vidual he<br>system 2<br>dary<br>her fuel)<br>ric keep-<br>ach of (23 | <wh yea<br="">ses (211<br/>eating sy<br/>?</wh> | r<br>)(221)<br>stems: | + (231)<br>Fu<br>kW<br>(21)<br>(21)<br>(21)<br>(21)<br>(21)<br>(23) | el<br>/h/year<br>1) x<br>3) x<br>5) x<br>9)<br>1)<br>y as app | (237b)    | =               | Fuel P<br>(Table<br>3.4<br>0<br>13.<br>3.4<br>13.   | rice<br>12)<br><sup>18</sup><br>19<br>19<br>19<br>19 | 45<br>x 0.01 =<br>x 0.01 =<br>x 0.01 =<br>x 0.01 =<br>x 0.01 =   | 276.25<br>-760.49<br>4673.17<br>Fuel Cost<br>£/year<br>102.72<br>0<br>0<br>74.15<br>9.89              | (230e)<br>](231)<br>](232)<br>](233)<br>](338)<br>](338)<br>](240)<br>](240)<br>](241)<br>](242)<br>](247)           |



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|   | one of (233) to (235) x)      | 13.19 × 0.01 =                | -100.31                        | (252) |
|---|-------------------------------|-------------------------------|--------------------------------|-------|
| Appendix Q items: repeat lines (253) and (254) as | needed                        |                               |                                | _     |
| Total energy cost(245)(247)                       | ) + (250)(254) =              |                               | 242.89                         | (255) |
| 11a. SAP rating - individual heating systems      |                               |                               |                                |       |
| Energy cost deflator (Table 12)                   |                               |                               | 0.42                           | (256) |
| Energy cost factor (ECF) [(255) x (25             | 6)] ÷ [(4) + 45.0] =          |                               | 0.96                           | (257) |
| SAP rating (Section 12)                           |                               |                               | 86.57                          | (258) |
| 12a. CO2 emissions – Individual heating systems   | s including micro-CHP         |                               |                                |       |
|   | <b>Energy</b><br>kWh/year     | Emission factor<br>kg CO2/kWh | <b>Emissions</b><br>kg CO2/yea |       |
| Space heating (main system 1)                     | (211) x                       | 0.216 =                       | 637.55                         | (261) |
| Space heating (secondary)                         | (215) x                       | 0.519 =                       | 0                              | (263) |
| Water heating                                     | (219) x                       | 0.216 =                       | 460.25                         | (264) |
| Space and water heating                           | (261) + (262) + (263) + (264) | =                             | 1097.8                         | (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x                       | 0.519 =                       | 38.93                          | (267) |
| Electricity for lighting                          | (232) x                       | 0.519 =                       | 143.37                         | (268) |
| Energy saving/generation technologies             |                               |                               |                                | _     |
| Item 1  |                               | 0.519 =                       | -394.7                         | (269) |
| Total CO2, kg/year                                |                               | um of (265)(271) =            | 885.41                         | (272) |
| CO2 emissions per m <sup>2</sup>                  | (2                            | 272) ÷ (4) =                  | 14.51                          | (273) |
| EI rating (section 14)                            |                               |                               | 89                             | (274) |
| 13a. Primary Energy                               |                               |                               |                                |       |
|   | <b>Energy</b><br>kWh/year     | <b>Primary</b><br>factor      | <b>P. Energy</b><br>kWh/year   |       |
| Space heating (main system 1)                     | (211) x                       | 1.22 =                        | 3600.99                        | (261) |
| Space heating (secondary)                         | (215) x                       | 3.07 =                        | 0                              | (263) |
| Energy for water heating                          | (219) x                       | 1.22 =                        | 2599.55                        | (264) |
| Space and water heating                           | (261) + (262) + (263) + (264) | =                             | 6200.55                        | (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x                       | 3.07 =                        | 230.25                         | (267) |
| Electricity for lighting                          | (232) x                       | 0 =                           | 848.09                         | (268) |
| Energy saving/generation technologies<br>Item 1   |                               | 3.07 =                        | -2334.71                       | (269) |
| 'Total Primary Energy                             | S                             | um of (265)(271) =            | 4944.18                        | (272) |
| Primary energy kWh/m²/year                        | (2                            | 272) ÷ (4) =                  | 81.05                          | (273) |



# **Regulations Compliance Report**

| Printed on 24 Janu   | ary 2023 at 14:47:1  |                                | a FSAP 2012 program, Version: 1.0.5 | 5.59 |
|----------------------|----------------------|--------------------------------|-------------------------------------|------|
| Project Informatio   |                      |                                |                                     |      |
| Assessed By:         | Leighton Howe (S     | TRO004042)                     | Building Type: Flat                 |      |
| Dwelling Details:    |                      |                                |                                     |      |
| NEW DWELLING         | DESIGN STAGE         |                                | Total Floor Area: 32m <sup>2</sup>  |      |
| Site Reference :     | AL-10                |                                | Plot Reference: Flat 4              |      |
| Address :            | Flat 4, Manor Cou    | rrt, 152 Abbey Road, LONDON    | I, NW6 4ST                          |      |
| Client Details:      |                      |                                |                                     |      |
| Name:                |                      |                                |                                     |      |
| Address :            |                      |                                |                                     |      |
| This report cover    | s items included w   | vithin the SAP calculations.   |                                     |      |
| -                    | te report of regulat |                                |                                     |      |
| 1a TER and DER       |                      |                                |                                     |      |
|                      | ng system: Mains g   | as                             |                                     |      |
| Fuel factor: 1.00 (n | • /                  | ·                              |                                     |      |
| -                    | xide Emission Rate   |                                | 28.67 kg/m <sup>2</sup>             |      |
| -                    | ioxide Emission Ra   | te (DER)                       | 19.54 kg/m²                         | OK   |
| 1b TFEE and DF       |                      | - \                            |                                     |      |
| -                    | gy Efficiency (TFEE  |                                | 74.5 kWh/m²                         |      |
| Dweiling Fabric En   | ergy Efficiency (DF  |                                | 69.8 kWh/m <sup>2</sup>             | ок   |
| 2 Fabric U-values    | S                    |                                |                                     |      |
| Element              |                      | Average                        | Highest                             |      |
| External v           | vall                 | 0.18 (max. 0.30)               | 0.18 (max. 0.70)                    | ОК   |
| Party wall           |                      | 0.00 (max. 0.20)               | -                                   | ОК   |
| Floor                |                      | (no floor)                     |                                     |      |
| Roof                 |                      | 0.16 (max. 0.20)               | 0.16 (max. 0.35)                    | OK   |
| Openings             |                      | 1.40 (max. 2.00)               | 1.40 (max. 3.30)                    | OK   |
| 2a Thermal bridg     | jing                 |                                |                                     |      |
|                      |                      | rom linear thermal transmittan | ces for each junction               |      |
| 3 Air permeabilit    |                      |                                |                                     |      |
| •                    | ility at 50 pascals  |                                | 5.00 (design value)                 | 01/  |
| Maximum              |                      |                                | 10.0                                | OK   |
| 4 Heating efficie    | ncy                  |                                |                                     |      |
| Main Heatin          | g system:            | Boiler systems with radiator   | s or underfloor heating - mains gas |      |
|                      |                      | Data from manufacturer         |                                     |      |
|                      |                      | Combi boiler                   |                                     |      |
|                      |                      | Efficiency 88.0 % SEDBUK       | 2009                                |      |
|                      |                      | Minimum 88.0 %                 |                                     | OK   |
| Secondary            | neating system:      | None                           |                                     |      |
|                      | ioating bystom.      |                                |                                     |      |
| 5 Cylinder insula    | ition                |                                |                                     |      |
| Hot water St         | torage:              | No cylinder                    |                                     |      |
|                      |                      |                                |                                     | N/A  |
|                      |                      |                                |                                     |      |
|                      |                      |                                |                                     |      |



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# **Regulations Compliance Report**

| 6 Controls   |  |  |    |
|--|--|--|----|
| Space heating controls<br>Hot water controls:  | Programmer and at leas<br>No cylinder thermostat | t two room thermostats   | OK |
| Boiler interlock:  | No cylinder<br>Yes                               |  | ок |
| 7 Low energy lights  |  |  |    |
| Percentage of fixed lights wit<br>Minimum  | h low-energy fittings                            | 100.0%<br>75.0%  | ОК |
| 8 Mechanical ventilation   |  |  |    |
| Not applicable   |  |  |    |
| 9 Summertime temperature   |  |  |    |
| Overheating risk (South Eas<br>Based on:<br>Overshading:<br>Windows facing: South<br>Windows facing: West<br>Ventilation rate:<br>Blinds/curtains: | t England):                                      | Medium<br>Average or unknown<br>12.6m <sup>2</sup><br>7.14m <sup>2</sup><br>6.00<br>Dark-coloured curtain or roller blind<br>Closed 100% of daylight hours | OK |
| 10 Key features<br>Party Walls U-value<br>Photovoltaic array   |  | 0 W/m²K  |    |

|   |                         |                    | User D      | Details:           |                  |             |                  |           |                                      |                  |
|---|-------------------------|--------------------|-------------|--------------------|------------------|-------------|------------------|-----------|--------------------------------------|------------------|
| Assessor Name:<br>Software Name:                    | Leighton I<br>Stroma FS |                    |             | Strom              | a Num<br>are Ver |             |                  |           | 004042<br>on: 1.0.5.59               |                  |
|   |                         |                    | Property    |                    |                  |             |                  |           |                                      |                  |
| Address :   |                         | or Court, 152 A    | bbey Roa    | ad, LONI           | DON, NV          | V6 4ST      |                  |           |                                      |                  |
| 1. Overall dwelling dir                             | nensions:               |                    | ٨٣٩         | e (m 2)            |                  | Av. 11a     | : o: la 4 ( ma ) |           | Valuma(m)                            | 2)               |
| Ground floor  |                         |                    | Are         | <b>a(m²)</b><br>32 | (1a) x           |             | <b>ight(m)</b>   | (2a) =    | <b>Volume(m</b> <sup>2</sup><br>76.8 | <b>)</b><br>(3a) |
| Total floor area TFA =                              | (1a)+(1b)+(1c)-         | -(1d)+(1e)+(1      | n)          | 32                 | (4)              |             |                  |           | 10.0                                 |                  |
| Dwelling volume                                     | (                       | (                  |             | 02                 |                  | )+(3c)+(3d  | l)+(3e)+         | .(3n) =   | 76.8                                 | (5)              |
| -   |                         |                    |             |                    | . , . ,          |             | , , ,            |           | 70.0                                 |                  |
| 2. Ventilation rate:                                | main                    | seconda            | iry         | other              |                  | total       |                  |           | m³ per hou                           | ır               |
| Number of chimneys                                  | heating                 | <b>heating</b>     | + [         | 0                  | 7 = Г            | 0           | x 4              | 40 =      | 0                                    | (6a)             |
| Number of open flues                                |                         |                    | <br>_ + _   | 0                  | 」 (<br>] = [     | 0           | x 2              | 20 =      | 0                                    | (6b)             |
| Number of intermittent                              |                         |                    |             | -                  | 」 [<br>「         | 2           | x ^              | 10 =      | 20                                   | (7a)             |
| Number of passive ver                               | its                     |                    |             |                    |                  | 0           | x ^              | 10 =      | 0                                    | (7b)             |
| Number of flueless gas                              |                         |                    |             |                    |                  | 0           | x 4              | 40 =      | 0                                    | (7c)             |
| 5   |                         |                    |             |                    |                  | •           |                  |           |                                      |                  |
|   |                         |                    |             |                    |                  |             |                  | Air ch    | anges per he                         | our              |
| Infiltration due to chimr                           | neys, flues and         | fans = (6a)+(6b)+  | (7a)+(7b)+( | (7c) =             | Г                | 20          | · [              | ÷ (5) =   | 0.26                                 | (8)              |
| If a pressurisation test ha                         |                         |                    | ed to (17), | otherwise o        | continue fr      | om (9) to ( | (16)             |           |                                      | _                |
| Number of storeys in<br>Additional infiltration     | i the dwelling (r       | IS)                |             |                    |                  |             | [(9).            | -1]x0.1 = | 0                                    | (9)              |
| Structural infiltration:                            | 0.25 for steel of       | or timber frame o  | or 0.35 fo  | r masoni           | rv constr        | uction      | [(0)             | 1,0.1 -   | 0                                    | (10)             |
| if both types of wall are<br>deducting areas of ope | e present, use the v    | alue corresponding |             |                    | •                |             |                  |           | 0                                    |                  |
| If suspended woode                                  | n floor, enter 0.       | 2 (unsealed) or (  | 0.1 (seale  | ed), else          | enter 0          |             |                  |           | 0                                    | (12)             |
| If no draught lobby, e                              |                         |                    |             |                    |                  |             |                  |           | 0                                    | (13)             |
| Percentage of windo                                 | ws and doors d          | raught stripped    |             |                    |                  |             |                  |           | 0                                    | (14)             |
| Window infiltration                                 |                         |                    |             | 0.25 - [0.2        |                  | - 1         | ( )              |           | 0                                    | (15)             |
| Infiltration rate                                   | 50                      |                    |             | (8) + (10)         |                  |             |                  |           | 0                                    | (16)             |
| Air permeability valu<br>If based on air permea     |                         |                    |             | •                  | •                | etre of e   | nvelope          | area      | 5                                    | (17)             |
| Air permeability value app                          | •                       |                    |             |                    |                  | is beina u: | sed              |           | 0.51                                 | (18)             |
| Number of sides shelte                              |                         |                    |             | gree an per        | , nearly s       | io sonig a  |                  |           | 1                                    | (19)             |
| Shelter factor                                      |                         |                    |             | (20) = 1 -         | [0.075 x (1      | 9)] =       |                  |           | 0.92                                 | (20)             |
| Infiltration rate incorpor                          | ating shelter fa        | ctor               |             | (21) = (18         | ) x (20) =       |             |                  |           | 0.47                                 | (21)             |
| Infiltration rate modified                          | d for monthly wi        | nd speed           |             |                    | -                |             | -                | -         |                                      |                  |
| Jan Feb   | Mar Apr                 | May Jun            | Jul         | Aug                | Sep              | Oct         | Nov              | Dec       |                                      |                  |
| Monthly average wind                                | speed from Tab          | ole 7              |             |                    | -                |             | -                | -         |                                      |                  |
| (22)m= 5.1 5  | 4.9 4.4                 | 4.3 3.8            | 3.8         | 3.7                | 4                | 4.3         | 4.5              | 4.7       |                                      |                  |
| Wind Factor (22a)m =                                | (22)m ÷ 4               |                    |             |                    |                  |             |                  |           |                                      |                  |
| (22a)m= 1.27 1.25                                   | 1.23 1.1                | 1.08 0.95          | 0.95        | 0.92               | 1                | 1.08        | 1.12             | 1.18      |                                      |                  |
|   |                         |                    |             |                    |                  |             |                  |           |                                      |                  |

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| Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m  |                                       |
|--|---------------------------------------|
| 0.6 0.59 0.58 0.52 0.51 0.45 0.45 0.44 0.47 0.51 0.53 0.55   |                                       |
| Calculate effective air change rate for the applicable case  |                                       |
| If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)   | 0 (23a)                               |
| If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =   | 0 (23b)<br>0 (23c)                    |
| a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × $[1 - (23c)]$  |                                       |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $   | ÷ 100]<br>(24a)                       |
| b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)   | , , , , , , , , , , , , , , , , , , , |
| (24b)m = 0  0  0  0  0  0  0  0  0  0  | (24b)                                 |
| c) If whole house extract ventilation or positive input ventilation from outside   |                                       |
| if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)   |                                       |
| (24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  | (24c)                                 |
| d) If natural ventilation or whole house positive input ventilation from loft  |                                       |
| if $(22b)m = 1$ , then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$  | (0.1.1)                               |
| (24d)m= 0.68 0.67 0.67 0.63 0.63 0.6 0.6 0.6 0.6 0.61 0.63 0.64 0.65   | (24d)                                 |
| Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)   |                                       |
| (25)m= 0.68 0.67 0.67 0.63 0.63 0.6 0.6 0.6 0.6 0.61 0.63 0.64 0.65  | (25)                                  |
| 3. Heat losses and heat loss parameter:  |                                       |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   |                                       |
| Doors 1.89 x 1.4 = 2.646   | (26)                                  |
| Windows Type 1 $12.6$ $x1/[1/(1.4) + 0.04] = 16.7$   | (27)                                  |
| Windows Type 2 $7.14$ $x^{1/[1/(1.4)+0.04]} = 9.47$  | (27)                                  |
| Walls Type1 42 19.74 22.26 x 0.18 = 4.01   | (29)                                  |
| Walls Type2         12         1.89         10.11         x         0.18         =         1.86  | (29)                                  |
| Roof 32 0 32 x 0.16 = 5.12   | (30)                                  |
| Total area of elements, m <sup>2</sup>   | (31)                                  |
| Party wall $16 \times 0 = 0$   | (32)                                  |
| Internal wall **   | (32c)                                 |
| Internal floor 48  | (32d)                                 |
| Internal ceiling 44  | (32e)                                 |
| * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph ** include the areas on both sides of internal walls and partitions |                                       |
| Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$  | 39.8 (33)                             |
| Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e) =   | 5358.33 (34)                          |
| Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m <sup>2</sup> K Indicative Value: Low   | 100 (35)                              |
| For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.                         |                                       |
| Thermal bridges : S (L x Y) calculated using Appendix K  | 6.88 (36)                             |
| if details of thermal bridging are not known $(36) = 0.05 \times (31)$<br>Total fabric heat loss $(33) + (36) =$   | 46.68 (37)                            |



| Ventila   | tion hea                    | at loss ca | alculated               | d monthly   | y              |            |              |             | (38)m                 | = 0.33 × (      | 25)m x (5)             |           |        |      |
|-----------|-----------------------------|------------|-------------------------|-------------|----------------|------------|--------------|-------------|-----------------------|-----------------|------------------------|-----------|--------|------|
|           | Jan                         | Feb        | Mar                     | Apr         | May            | Jun        | Jul          | Aug         | Sep                   | Oct             | Nov                    | Dec       |        |      |
| (38)m=    | 17.26                       | 17.09      | 16.91                   | 16.09       | 15.94          | 15.22      | 15.22        | 15.09       | 15.5                  | 15.94           | 16.25                  | 16.57     |        | (38) |
| Heat tr   | ansfer c                    | coefficie  | nt, W/K                 |             | -              | -          |              |             | (39)m                 | = (37) + (3     | 38)m                   | -         |        |      |
| (39)m=    | 63.94                       | 63.77      | 63.59                   | 62.77       | 62.62          | 61.9       | 61.9         | 61.77       | 62.18                 | 62.62           | 62.93                  | 63.25     |        |      |
|           |                             |            |                         |             |                |            |              |             |                       | -               | Sum(39)1.              | 12 /12=   | 62.77  | (39) |
|           | · ·                         |            | HLP), W/                | · · · · · · |                |            |              |             | · · /                 | = (39)m ÷       | <u> </u>               |           |        |      |
| (40)m=    | 2                           | 1.99       | 1.99                    | 1.96        | 1.96           | 1.93       | 1.93         | 1.93        | 1.94                  | 1.96            | 1.97                   | 1.98      | 4.00   | (40) |
| Numbe     | er of day                   | rs in mo   | nth (Tab                | le 1a)      |                |            |              |             | /                     | Average =       | Sum(40) <sub>1.</sub>  | 12 / 1 Z= | 1.96   | (40) |
|           | 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 ene    | rgy requ                | irement:    |                |            |              |             |                       |                 |                        | kWh/ye    | ear:   |      |
|           |                             |            |                         |             |                |            |              |             |                       |                 |                        |           |        |      |
|           | ed occu<br>A > 13.9         |            | N<br>+ 1.76 x           | [1 - exp    | (-0.0003       | 349 x (TF  | -<br>A -13.9 | )2)] + 0.(  | )013 x ( <sup>-</sup> | TFA -13.        |                        | 21        |        | (42) |
|           | A £ 13.9                    |            |                         | i onp       | ( 0.0000       |            |              | )_)] : 0.0  |                       |                 | ,                      |           |        |      |
|           |                             |            | ater usag               |             |                |            |              |             |                       | a targat a      |                        | .02       |        | (43) |
|           |                             | -          | hot water<br>person pei |             |                | -          | -            | o acmeve    | a water us            | se largel o     | I                      |           |        |      |
|           | Jan                         | Feb        | Mar                     | Apr         | May            | Jun        | Jul          | Aug         | Sep                   | Oct             | Nov                    | Dec       |        |      |
| Hot wate  |                             |            | r day for ea            |             | ,              |            |              | -           |                       |                 | 1100                   | Dee       |        |      |
| (44)m=    | 69.33                       | 66.81      | 64.29                   | 61.76       | 59.24          | 56.72      | 56.72        | 59.24       | 61.76                 | 64.29           | 66.81                  | 69.33     |        |      |
|           |                             |            |                         |             |                |            |              |             | -                     | I<br>Total = Su | m(44) <sub>112</sub> = | -         | 756.3  | (44) |
| Energy o  | content of                  | hot water  | used - cal              | culated mo  | onthly $= 4$ . | 190 x Vd,r | n x nm x C   | 0Tm / 3600  | ) kWh/mor             | oth (see Ta     | ables 1b, 1            | c, 1d)    |        |      |
| (45)m=    | 102.81                      | 89.92      | 92.79                   | 80.89       | 77.62          | 66.98      | 62.07        | 71.22       | 72.07                 | 84              | 91.69                  | 99.57     |        |      |
| lf inoton |                             | ator boot  | na of noint             | of upp /m   | botwata        | ( atorogo) | ontor 0 in   | haven /AG   |                       | Total = Su      | m(45) <sub>112</sub> = | -         | 991.63 | (45) |
|           |                             |            | ng at point             | · ·         |                |            |              |             |                       |                 |                        |           |        | (40) |
|           | <sup>15.42</sup><br>storage |            | 13.92                   | 12.13       | 11.64          | 10.05      | 9.31         | 10.68       | 10.81                 | 12.6            | 13.75                  | 14.93     |        | (46) |
|           | -                           |            | ) includir              | ng any so   | olar or W      | /WHRS      | storage      | within sa   | ame ves               | sel             |                        | 0         |        | (47) |
| -         |                             | . ,        | and no ta               |             |                |            | -            |             |                       |                 |                        | -         |        |      |
| Otherw    | vise if no                  | stored     | hot wate                | er (this ir | icludes i      | nstantar   | neous co     | mbi boil    | ers) ente             | er '0' in (     | 47)                    |           |        |      |
|           | storage                     |            |                         |             |                |            | <i>.</i>     |             |                       |                 |                        |           |        |      |
| ,         |                             |            | eclared I               |             | or is kno      | wn (kWł    | n/day):      |             |                       |                 |                        | 0         |        | (48) |
| •         |                             |            | m Table                 |             |                |            |              |             |                       |                 |                        | 0         |        | (49) |
| 0,        |                             |            | r storage<br>eclared o  |             |                | or is not  |              | (48) x (49) | ) =                   |                 |                        | 0         |        | (50) |
| •         |                             |            | factor fr               | •           |                |            |              |             |                       |                 |                        | 0         |        | (51) |
|           |                             | -          | ee secti                |             |                |            | • •          |             |                       |                 |                        |           |        |      |
|           | e factor                    |            |                         |             |                |            |              |             |                       |                 |                        | 0         |        | (52) |
| Tempe     | erature fa                  | actor fro  | m Table                 | 2b          |                |            |              |             |                       |                 |                        | 0         |        | (53) |
|           |                             |            | storage                 | e, kWh/y€   | ear            |            |              | (47) x (51) | ) x (52) x (          | 53) =           |                        | 0         |        | (54) |
|           | (50) or (                   | . , .      |                         |             |                |            |              | ((50)       |                       |                 |                        | 0         |        | (55) |
|           | storage                     | loss cal   | culated t               | ror each    | month          |            |              | ((56)m = (  | 55) × (41)ı           | m               |                        |           |        |      |
| (56)m=    | 0                           | 0          | 0                       | 0           | 0              | 0          | 0            | 0           | 0                     | 0               | 0                      | 0         |        | (56) |





| If cylinder contains dedic | ated solar stor | age, (57)n | n = (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) |
| Primary circuit loss       | annual) fro     | m Table    | 3         | -           |             | -            |               | -           |               | 0           |               | (58) |
| Primary circuit loss       | alculated for   | or each    | month (   | 59)m = (    | (58) ÷ 36   | 65 × (41)    | m             |             |               |             |               |      |
| (modified by facto         | r from Table    | e H5 if th | nere is s | solar wat   | er heatii   | ng and a     | cylinde       | r thermo    | stat)         |             |               |      |
| (59)m= 0 0                 | 0               | 0          | 0         | 0           | 0           | 0            | 0             | 0           | 0             | 0           |               | (59) |
| Combi loss calculate       | ed for each     | month (    | 61)m =    | (60) ÷ 36   | 65 × (41)   | )m           |               |             |               |             |               |      |
| (61)m= 35.33 30.7          | 5 32.76         | 30.46      | 30.19     | 27.97       | 28.91       | 30.19        | 30.46         | 32.76       | 32.95         | 35.33       |               | (61) |
| Total heat required        | or water he     | ating ca   | lculated  | for eacl    | h month     | (62)m =      | 0.85 × (      | (45)m +     | (46)m +       | (57)m +     | (59)m + (61)m |      |
| (62)m= 138.14 120.6        | 7 125.55        | 111.35     | 107.81    | 94.95       | 90.97       | 101.41       | 102.53        | 116.75      | 124.63        | 134.9       |               | (62) |
| Solar DHW input calcula    | ed using Appe   | endix G or | Appendix  | H (negati   | ve quantity | /) (enter '0 | ' if no sola  | r contribut | ion to wate   | er heating) |               |      |
| (add additional lines      | if FGHRS a      | and/or V   | VWHRS     | applies     | , see Ap    | pendix C     | G)            |             | -             | -           |               |      |
| (63)m= 0 0                 | 0               | 0          | 0         | 0           | 0           | 0            | 0             | 0           | 0             | 0           |               | (63) |
| Output from water h        | eater           |            |           |             |             |              |               |             |               |             |               |      |
| (64)m= 138.14 120.6        | 7 125.55        | 111.35     | 107.81    | 94.95       | 90.97       | 101.41       | 102.53        | 116.75      | 124.63        | 134.9       |               | _    |
|                            |                 |            |           |             |             | Outp         | out from wa   | ater heate  | r (annual)₁   | 12          | 1369.67       | (64) |
| Heat gains from wat        | er heating,     | kWh/mc     | onth 0.2  | 5´[0.85     | × (45)m     | ı + (61)m    | n] + 0.8 >    | (46)m       | + (57)m       | + (59)m     | ]             |      |
| (65)m= 43.02 37.5          | 39.04           | 34.51      | 33.36     | 29.26       | 27.86       | 31.23        | 31.58         | 36.12       | 38.72         | 41.94       |               | (65) |
| include (57)m in c         | alculation o    | of (65)m   | only if c | ylinder is  | s in the o  | dwelling     | or hot w      | ater is fr  | om com        | munity h    | eating        |      |
| 5. Internal gains (s       | ee Table 5      | and 5a)    | :         |             |             |              |               |             |               |             |               |      |
| Metabolic gains (Ta        | ole 5), Watt    | S          |           |             |             |              |               |             |               |             |               |      |
| Jan Fe                     |                 | Apr        | May       | Jun         | Jul         | Aug          | Sep           | Oct         | Nov           | Dec         |               |      |
| (66)m= 72.82 72.8          | 2 72.82         | 72.82      | 72.82     | 72.82       | 72.82       | 72.82        | 72.82         | 72.82       | 72.82         | 72.82       |               | (66) |
| Lighting gains (calc       | lated in Ap     | pendix L   | _, equat  | ion L9 oi   | r L9a), a   | lso see      | Table 5       |             |               |             |               |      |
| (67)m= 22.75 20.2          | 16.43           | 12.44      | 9.3       | 7.85        | 8.48        | 11.03        | 14.8          | 18.79       | 21.93         | 23.38       |               | (67) |
| Appliances gains (c        | alculated in    | Append     | lix L, eq | uation L    | 13 or L1    | 3a), also    | see Ta        | ble 5       |               |             |               |      |
| (68)m= 152.33 153.9        | 1 149.92        | 141.44     | 130.74    | 120.68      | 113.96      | 112.38       | 116.36        | 124.84      | 135.54        | 145.61      |               | (68) |
| Cooking gains (calc        | ulated in Ap    | pendix l   | L, equat  | tion L15    | or L15a)    | ), also se   | e Table       | 5           |               |             |               |      |
| (69)m= 43.5 43.5           | 43.5            | 43.5       | 43.5      | 43.5        | 43.5        | 43.5         | 43.5          | 43.5        | 43.5          | 43.5        |               | (69) |
| Pumps and fans gai         | ns (Table 5     | a)         |           |             |             |              |               |             |               |             |               |      |
| (70)m= 3 3                 | 3               | 3          | 3         | 3           | 3           | 3            | 3             | 3           | 3             | 3           |               | (70) |
| Losses e.g. evapora        | tion (negati    | ive value  | es) (Tab  | le 5)       |             |              |               |             |               |             |               |      |
| (71)m= -48.55 -48.5        | 5 -48.55        | -48.55     | -48.55    | -48.55      | -48.55      | -48.55       | -48.55        | -48.55      | -48.55        | -48.55      |               | (71) |
| Water heating gains        | (Table 5)       | ı          |           |             |             |              |               |             |               |             |               |      |
| (72)m= 57.82 55.9          | 3 52.48         | 47.93      | 44.83     | 40.64       | 37.45       | 41.97        | 43.86         | 48.55       | 53.78         | 56.37       |               | (72) |
| Total internal gains       | ; =             | l          |           | (66)        | m + (67)m   | n + (68)m +  | + (69)m + (   | (70)m + (7  | 1)m + (72)    | m           | I             |      |
| (73)m= 303.66 300.8        | 1 289.6         | 272.59     | 255.64    | 239.94      | 230.66      | 236.15       | 245.79        | 262.95      | 282.03        | 296.12      |               | (73) |
| 6. Solar gains:            |                 |            |           |             | •           | •            | •             | •           |               | •           |               |      |
| Solar gains are calculat   | ed using solar  | flux from  | Table 6a  | and assoc   | iated equa  | itions to co | onvert to th  | e applicat  | le orientat   | ion.        |               |      |
| Orientation: Acces         | Factor          | <b>A</b>   |           | <b>_</b> 1  |             |              |               |             |               |             | <b>a</b> .    |      |
| Table                      |                 | Area<br>m² |           | Flu         | x<br>ole 6a |              | g_<br>able 6b | _           | FF<br>able 6c |             | Gains<br>(W)  |      |

thermenergy

| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 4       | 6.75      | x                 |       | 0.57             | x     | 0.7      |     | =   | 162.88 | (78) |
|---------|-----------|------------|---------|-----------|-----------|-----------|-------|---------|-----------|-------------------|-------|------------------|-------|----------|-----|-----|--------|------|
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 7       | 6.57      | x                 |       | 0.57             | x     | 0.7      |     | =   | 266.76 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | g       | 7.53      | x                 |       | 0.57             | x     | 0.7      |     | =   | 339.81 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 1       | 10.23     | X                 |       | 0.57             | x     | 0.7      |     | =   | 384.06 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 1       | 14.87     | x                 |       | 0.57             | x     | 0.7      |     | =   | 400.21 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 1       | 10.55     | ×                 |       | 0.57             | x     | 0.7      |     | =   | 385.15 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 1       | 08.01     | Ī×                |       | 0.57             | ×     | 0.7      |     | =   | 376.31 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 1       | 04.89     | -<br>  x          |       | 0.57             | x     | 0.7      |     | =   | 365.45 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 1       | 01.89     | ×                 |       | 0.57             | x     | 0.7      |     | =   | 354.97 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 8       | 2.59      | X                 |       | 0.57             | x     | 0.7      |     | =   | 287.73 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     | 5       | 5.42      | -<br>  x          |       | 0.57             | ×     | 0.7      |     | =   | 193.07 | (78) |
| South   | 0.9x      | 0.77       |         | x         | 12.       | .6        | x     |         | 40.4      | _<br>  x          |       | 0.57             | x     | 0.7      |     | =   | 140.75 | (78) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 1       | 9.64      | Ī×                |       | 0.57             | ×     | 0.7      |     | =   | 38.77  | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 3       | 8.42      | -<br>  x          |       | 0.57             | x     | 0.7      |     | =   | 75.85  | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 6       | 3.27      | ] ×               |       | 0.57             | ×     | 0.7      |     | =   | 124.92 | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 9       | 2.28      | ] ×               |       | 0.57             | ×     | 0.7      |     | =   | 182.18 | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 1       | 13.09     | -<br>  x          |       | 0.57             | x     | 0.7      |     | =   | 223.27 | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 1       | 15.77     | ] ×               |       | 0.57             | x     | 0.7      |     | =   | 228.56 | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 1       | 10.22     |                   |       | 0.57             | x     | 0.7      |     | =   | 217.6  | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 9       | 4.68      | ×                 |       | 0.57             | x     | 0.7      |     | =   | 186.91 | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 7       | 3.59      | Ī×                |       | 0.57             | ×     | 0.7      |     | =   | 145.28 | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 4       | 5.59      | ] ×               |       | 0.57             | ×     | 0.7      |     | =   | 90     | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 2       | 4.49      | _<br>  x          |       | 0.57             | x     | 0.7      |     | =   | 48.35  | (80) |
| West    | 0.9x      | 0.77       |         | x         | 7.1       | 4         | x     | 1       | 6.15      | ×                 |       | 0.57             | x     | 0.7      |     | =   | 31.89  | (80) |
|         | -         |            |         |           |           |           |       |         |           | -                 |       |                  |       |          |     |     |        |      |
| Solar g | jains in  | watts, ca  | alculat | ed        | for eacl  | n mont    | h     |         |           | (83)r             | n = S | um(74)m          | (82)m | 1        |     |     |        |      |
| (83)m=  | 201.66    | 342.61     | 464.7   | 2         | 566.24    | 623.48    | 6     | 613.71  | 593.91    | 552               | 2.37  | 500.25           | 377.7 | 3 241.42 | 172 | .63 |        | (83) |
| Total g | ains – i  | nternal a  | and so  | lar       | (84)m =   | = (73)m   | 1+(   | 83)m    | , watts   | -                 |       |                  |       |          |     |     |        |      |
| (84)m=  | 505.32    | 643.42     | 754.3   | 2         | 838.83    | 879.13    | 8     | 853.65  | 824.57    | 788               | 3.51  | 746.04           | 640.6 | 523.45   | 468 | .76 |        | (84) |
| 7. Me   | an intei  | rnal temp  | peratu  | e (       | (heating  | seaso     | n)    |         |           |                   |       |                  |       |          |     |     |        |      |
| Temp    | erature   | during h   | neating | j p       | eriods ir | n the liv | ving  | area    | from Tal  | ble 9             | ), Th | 1 (°C)           |       |          |     |     | 21     | (85) |
| Utilisa | ation fac | ctor for g | ains fo | or li     | iving are | ea, h1,r  | n (s  | see Ta  | ble 9a)   |                   |       |                  |       |          | _   |     |        |      |
|         | Jan       | Feb        | Ма      | r         | Apr       | May       | '     | Jun     | Jul       | A                 | ug    | Sep              | Oc    | t Nov    | D   | ec  |        |      |
| (86)m=  | 0.86      | 0.8        | 0.72    |           | 0.63      | 0.52      |       | 0.4     | 0.3       | 0.                | 33    | 0.47             | 0.67  | 0.81     | 0.8 | 37  |        | (86) |
| Mean    | interna   | l temper   | ature i | n l       | iving are | ea T1 (   | follo | ow ste  | ps 3 to 7 | 7 in <sup>-</sup> | Tabl  | e 9c)            |       |          |     |     |        |      |
| (87)m=  | 18.27     | 18.78      | 19.37   | ,         | 19.98     | 20.45     |       | 20.77   | 20.9      | 20                | .89   | 20.66            | 20.02 | 2 19.04  | 18. | 17  |        | (87) |
| Temp    | erature   | during h   | neating |           | eriods ir | n rest o  | f dv  | velling | from Ta   | able              | 9, T  | h2 (°C)          |       |          | -   |     |        |      |
| (88)m=  | 19.33     | 19.34      | 19.34   | <u> </u>  | 19.36     | 19.36     | -     | 19.38   | 19.38     | 1                 | .38   | 19.37            | 19.3  | 6 19.36  | 19. | 35  |        | (88) |
| Utilisa | ation fac | tor for g  | ains fo | n<br>or r | est of d  | wellina   | . h2  | .m (se  | e Table   | 9a)               |       | ,                |       |          | •   |     |        |      |
| (89)m=  | 0.84      | 0.77       | 0.68    | -         | 0.58      | 0.45      | -     | 0.32    | 0.2       | <del>r í</del>    | 22    | 0.39             | 0.61  | 0.78     | 0.8 | 35  |        | (89) |
|         |           |            |         |           |           |           | _     |         |           | I                 |       | I I<br>7 in Tobl |       | <b>I</b> | 1   |     |        |      |

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







| (90)m=  | 17.02      | 17.5      | 18.05      | 18.61     | 19.01       | 19.27          | 19.35     | 19.34       | 19.19      | 18.67        | 17.77                   | 16.93       |         | (90)  |
|---------|------------|-----------|------------|-----------|-------------|----------------|-----------|-------------|------------|--------------|-------------------------|-------------|---------|-------|
|         |            |           |            |           |             |                |           |             | f          | LA = Livin   | g area ÷ (4             | 4) =        | 0.78    | (91)  |
| Mean    | internal   | temper    | ature (fo  | r the wh  | ole dwe     | llina) – fl    | Δ 🗙 Τ1    | + (1 – fL   | A) x T2    |              |                         | •           |         |       |
| (92)m=  | 18         | 18.5      | 19.08      | 19.68     | 20.14       | 20.44          | 20.56     | 20.55       | 20.34      | 19.73        | 18.77                   | 17.9        |         | (92)  |
|         | adiustr    | nent to t | he mear    | internal  | l<br>temper | I<br>ature fro | n Table   | e 4e, whe   | ere appro  | opriate      |                         |             |         |       |
| (93)m=  | 18         | 18.5      | 19.08      | 19.68     | 20.14       | 20.44          | 20.56     | 20.55       | 20.34      | 19.73        | 18.77                   | 17.9        |         | (93)  |
|         | ace heat   | tina reau | uirement   |           |             |                |           |             |            |              |                         |             |         |       |
|         |            |           |            |           | re obtair   | ned at ste     | ep 11 of  | Table 9     | o. so tha  | t Ti.m=(     | 76)m an                 | d re-calc   | ulate   |       |
|         |            |           |            | using Ta  |             |                |           |             |            |              |                         |             |         |       |
|         | Jan        | Feb       | Mar        | Apr       | May         | Jun            | Jul       | Aug         | Sep        | Oct          | Nov                     | Dec         |         |       |
| Utilisa | ation fac  | tor for g | ains, hm   | 1:        |             |                |           | -           |            |              |                         |             |         |       |
| (94)m=  | 0.82       | 0.75      | 0.68       | 0.59      | 0.49        | 0.37           | 0.28      | 0.3         | 0.44       | 0.62         | 0.76                    | 0.83        |         | (94)  |
| Usefu   | ıl gains,  | hmGm ,    | W = (94    | 4)m x (84 | 4)m         |                |           |             |            |              |                         |             |         |       |
| (95)m=  | 412.74     | 483.32    | 511.55     | 492.96    | 427.64      | 319.43         | 228.88    | 236.45      | 327.34     | 398.66       | 399.85                  | 390.42      |         | (95)  |
| Month   | nly avera  | age exte  | rnal tem   | perature  | e from Ta   | able 8         |           |             |            |              |                         |             |         |       |
| (96)m=  | 4.3        | 4.9       | 6.5        | 8.9       | 11.7        | 14.6           | 16.6      | 16.4        | 14.1       | 10.6         | 7.1                     | 4.2         |         | (96)  |
| Heat    | loss rate  | e for mea |            | · · ·     | · · ·       | Lm , W =       | =[(39)m   | x [(93)m    | – (96)m    | ]            |                         |             |         |       |
| (97)m=  | 876.04     | 867.46    | 800.15     | 676.91    | 528.37      | 361.53         | 245.42    | 256.29      | 388.15     | 571.48       | 734.06                  | 866.7       |         | (97)  |
| Space   | i          |           |            | i         | nonth, k\   | Wh/mon         | th = 0.02 | 24 x [(97]  | )m – (95   | )m] x (4′    | 1)m                     |             |         |       |
| (98)m=  | 344.69     | 258.14    | 214.71     | 132.44    | 74.95       | 0              | 0         | 0           | 0          | 128.58       | 240.63                  | 354.35      |         | _     |
|         |            |           |            |           |             |                |           | Tota        | l per year | (kWh/year    | <sup>.</sup> ) = Sum(9  | 8)15,912 =  | 1748.49 | (98)  |
| Space   | e heating  | g require | ement in   | kWh/m²    | ²/year      |                |           |             |            |              |                         |             | 54.64   | (99)  |
| 9a. En  | ergy req   | uiremer   | nts – Indi | ividual h | eating s    | vstems i       | ncluding  | micro-C     | CHP)       |              |                         |             |         |       |
|         | e heatin   |           |            |           |             | ,<br>          | 0         |             | ,          |              |                         |             |         |       |
| -       |            | -         | t from s   | econdar   | y/supple    | mentary        | system    |             |            |              |                         |             | 0       | (201) |
| Fracti  | on of sp   | ace hea   | it from m  | nain syst | em(s)       |                |           | (202) = 1 - | - (201) =  |              |                         | ļ           | 1       | (202) |
| Fracti  | on of to   | al heati  | na from    | main sys  | stem 1      |                |           | (204) = (2  | 02) × [1 – | (203)] =     |                         |             | 1       | (204) |
|         |            |           | -          | ing syste |             |                |           |             |            |              |                         |             | 88.8    | (206) |
|         | -          | -         |            | • •       |             | aoveter        | . 0/      |             |            |              |                         |             |         | 4     |
| EIIICIE |            |           |            | ementar   |             | g system       | i         | 1           |            |              | r                       |             | 0       | (208) |
|         | Jan        | Feb       | Mar        | Apr       | May         | Jun            | Jul       | Aug         | Sep        | Oct          | Nov                     | Dec         | kWh/ye  | ear   |
| Space   | i          |           |            | alculate  | i           | i              | i         |             | i          |              | i                       | ·1          |         |       |
|         | 344.69     | 258.14    | 214.71     | 132.44    | 74.95       | 0              | 0         | 0           | 0          | 128.58       | 240.63                  | 354.35      |         |       |
| (211)m  | n = {[(98] | )m x (20  | 4)] } x 1  | 00 ÷ (20  | )6)         |                |           |             |            |              |                         |             |         | (211) |
|         | 388.16     | 290.7     | 241.79     | 149.14    | 84.4        | 0              | 0         | 0           | 0          | 144.79       | 270.98                  | 399.04      |         |       |
|         |            |           |            |           |             |                |           | Tota        | l (kWh/yea | ar) =Sum(2   | 211) <sub>15,1012</sub> | F           | 1969.02 | (211) |
| Space   | e heating  | g fuel (s | econdar    | y), kWh/  | month       |                |           |             |            |              |                         | -           |         |       |
| = {[(98 | )m x (20   | 1)]}x1    | 00 ÷ (20   | (8)       |             |                |           | -           |            |              |                         |             |         |       |
| (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> | =           | 0       | (215) |
| Water   | heating    | l         |            |           |             |                |           |             |            |              |                         | •           |         |       |
| Output  | from wa    | ater hea  | ter (calc  | le hatelu | hove)       |                |           |             |            |              |                         |             |         |       |
|         |            |           |            | ſ         |             | ·              | r         |             | -          |              |                         | · · · · · · |         |       |
|         | 138.14     | 120.67    | 125.55     | 111.35    | 107.81      | 94.95          | 90.97     | 101.41      | 102.53     | 116.75       | 124.63                  | 134.9       |         | (216) |



| (217)m= 85.92 85.61 85  | .13 84.3                   | 83.07     | 79.5              | 79.5                   | 79.5       | 79.5       | 84.12                   | 85.39                   | 86.03                         | ]                              | (217)  |
|---|----------------------------|-----------|-------------------|------------------------|------------|------------|-------------------------|-------------------------|-------------------------------|--------------------------------|--------|
| Fuel for water heating, kW                                      |                            |           |                   |                        | 1          | 1          |                         | I                       | 1                             | <b>_</b>                       |        |
| $(219)m = (64)m \times 100 \div ($<br>(219)m = 160.77 140.95 14 | <u>217)m</u><br>7.48 132.1 | 129.79    | 119.44            | 114.43                 | 127.56     | 128.97     | 138.8                   | 145.95                  | 156.81                        | 1                              |        |
|   |                            |           |                   |                        |            | l = Sum(2  |                         |                         |                               | 1643.06                        | (219)  |
| Annual totals   |                            |           |                   |                        |            |            | k                       | Wh/yea                  | r                             | kWh/year                       | ], ,   |
| Space heating fuel used, r                                      | nain system                | 1         |                   |                        |            |            |                         |                         |                               | 1969.02                        | ]      |
| Water heating fuel used   |                            |           |                   |                        |            |            |                         |                         |                               | 1643.06                        | ]      |
| Electricity for pumps, fans                                     | and electric               | keep-ho   | t                 |                        |            |            |                         |                         |                               |                                |        |
| central heating pump:   |                            |           |                   |                        |            |            |                         |                         | 30                            | ]                              | (230c) |
| boiler with a fan-assisted                                      | flue                       |           |                   |                        |            |            |                         |                         | 45                            | ]                              | (230e) |
| Total electricity for the abo                                   | ve, kWh/yea                | ar        |                   |                        | sum        | of (230a). | (230g) =                |                         |                               | 75                             | (231)  |
| Electricity for lighting  |                            |           |                   |                        |            |            |                         |                         |                               | 160.68                         | (232)  |
| Electricity generated by P                                      | /s                         |           |                   |                        |            |            |                         |                         |                               | -608.39                        | (233)  |
| Total delivered energy for                                      | all uses (211              | )(221)    | + (231)           | + (232)                | (237b)     | =          |                         |                         |                               | 3239.37                        | (338)  |
| 10a. Fuel costs - individu                                      | al heating sy              | vstems:   |                   |                        |            |            |                         |                         |                               |                                | -      |
|   |                            |           | <b>Fu</b><br>kW   | <b>el</b><br>/h/year   |            |            | <b>Fuel P</b><br>(Table |                         |                               | <b>Fuel Cost</b><br>£/year     |        |
| Space heating - main system                                     | em 1                       |           | (21               | 1) x                   |            |            | 3.4                     | 18                      | x 0.01 =                      | 68.52                          | (240)  |
| Space heating - main syst                                       | em 2                       |           | (21:              | 3) x                   |            |            | C                       | )                       | x 0.01 =                      | 0                              | (241)  |
| Space heating - secondary                                       | /                          |           | (21               | 5) x                   |            |            | 13.                     | 19                      | x 0.01 =                      | 0                              | (242)  |
| Water heating cost (other                                       | fuel)                      |           | (219              | 9)                     |            |            | 3.4                     | 18                      | x 0.01 =                      | 57.18                          | (247)  |
| Pumps, fans and electric k                                      | eep-hot                    |           | (23               | 1)                     |            |            | 13.                     | 19                      | x 0.01 =                      | 9.89                           | (249)  |
| (if off-peak tariff, list each of Energy for lighting           | of (230a) to (             | · • • ·   | eparately<br>(232 |                        | licable a  | nd apply   | · · · ·                 |                         | rding to $\frac{1}{x 0.01} =$ |                                | (250)  |
| Additional standing charge                                      | es (Table 12)              |           |                   |                        |            |            |                         |                         |                               | 120                            | (251)  |
|   |                            |           | one               | of (233) t             | o (235) x) |            | 13.                     | 19                      | x 0.01 =                      | -80.25                         | (252)  |
| Appendix Q items: repeat  | lines (253) a              | nd (254)  | as need           | ded                    |            |            |                         |                         |                               |                                | _      |
| Total energy cost   |                            |           | 247) + (25        | 50)(254)               | =          |            |                         |                         |                               | 196.54                         | (255)  |
| 11a. SAP rating - individu                                      | ial heating sy             | ystems    |                   |                        |            |            |                         |                         |                               |                                |        |
| Energy cost deflator (Table                                     | e 12)                      |           |                   |                        |            |            |                         |                         |                               | 0.42                           | (256)  |
| Energy cost factor (ECF)  |                            | [(255) x  | (256)] ÷ [(       | 4) + 45.0]             | =          |            |                         |                         |                               | 1.07                           | (257)  |
| SAP rating (Section 12)   |                            |           |                   |                        |            |            |                         |                         |                               | 85.05                          | (258)  |
| 12a. CO2 emissions – Ind  | dividual heat              | ing syste | ems inclu         | uding mi               | cro-CHF    | )          |                         |                         |                               |                                |        |
|   |                            |           |                   | <b>ergy</b><br>/h/year |            |            | <b>Emiss</b><br>kg CO   | <b>ion fac</b><br>2/kWh | tor                           | <b>Emissions</b><br>kg CO2/yea | ır     |
| Space heating (main syste                                       | em 1)                      |           | (21               | 1) x                   |            |            | 0.2                     | 16                      | =                             | 425.31                         | (261)  |



| Space heating (secondary)  | (215) x   | 0.519   | =      | 0  | (263)                                     |
|--|---|---|--------|--|---|
| Water heating  | (219) x   | 0.216   | =      | 354.9  | (264)                                     |
| Space and water heating  | (261) + (262) + (263) + (26   | 4) =  |        | 780.21   | (265)                                     |
| Electricity for pumps, fans and electric keep-hot  | (231) x   | 0.519   | =      | 38.93  | (267)                                     |
| Electricity for lighting   | (232) x   | 0.519   | =      | 83.4   | (268)                                     |
| Energy saving/generation technologies<br>Item 1  |   | 0.519   | =      | -315.76  | (269)                                     |
| Total CO2, kg/year   |   | sum of (265)(271) =                                 |        | 586.77   | (272)                                     |
| CO2 emissions per m <sup>2</sup>   |   | (272) ÷ (4) =                                       |        | 18.34  | (273)                                     |
| EI rating (section 14)   |   |   |        | 90   | (274)                                     |
| 13a. Primary Energy  |   |   |        |  |   |
|  |   |   |        |  |   |
|  | <b>Energy</b><br>kWh/year   | <b>Primary</b><br>factor                            |        | <b>P. Energy</b><br>kWh/year                                     |   |
| Space heating (main system 1)  |   |   | =      |  | (261)                                     |
| Space heating (main system 1)<br>Space heating (secondary)   | kWh/year  | factor  | =      | kWh/year   | )(261)<br>)(263)                          |
|  | kWh/year<br>(211) x   | factor  |        | kWh/year   |   |
| Space heating (secondary)  | kWh/year<br>(211) x<br>(215) x  | factor<br>1.22<br>3.07<br>1.22                      | =      | kWh/year<br>2402.2<br>0  | (263)                                     |
| Space heating (secondary)<br>Energy for water heating  | kWh/year<br>(211) x<br>(215) x<br>(219) x   | factor<br>1.22<br>3.07<br>1.22                      | =      | kWh/year<br>2402.2<br>0<br>2004.53                               | (263)<br>(264)                            |
| Space heating (secondary)<br>Energy for water heating<br>Space and water heating   | kWh/year<br>(211) x<br>(215) x<br>(219) x<br>(261) + (262) + (263) + (26            | factor<br>1.22<br>3.07<br>1.22<br>4) =              | =      | kWh/year<br>2402.2<br>0<br>2004.53<br>4406.73                    | (263)<br>(264)<br>(265)                   |
| Space heating (secondary)<br>Energy for water heating<br>Space and water heating<br>Electricity for pumps, fans and electric keep-hot  | kWh/year<br>(211) x<br>(215) x<br>(219) x<br>(261) + (262) + (263) + (26<br>(231) x | factor<br>1.22<br>3.07<br>1.22<br>4) =<br>3.07      | =<br>= | kWh/year<br>2402.2<br>0<br>2004.53<br>4406.73<br>230.25          | (263)<br>(264)<br>(265)<br>(267)          |
| Space heating (secondary)<br>Energy for water heating<br>Space and water heating<br>Electricity for pumps, fans and electric keep-hot<br>Electricity for lighting<br>Energy saving/generation technologies | kWh/year<br>(211) x<br>(215) x<br>(219) x<br>(261) + (262) + (263) + (26<br>(231) x | factor<br>1.22<br>3.07<br>1.22<br>4) =<br>3.07<br>0 | =      | kWh/year<br>2402.2<br>0<br>2004.53<br>4406.73<br>230.25<br>493.3 | (263)<br>(264)<br>(265)<br>(267)<br>(268) |

