

# Full SAP Calculation Printout



|                                    |                                                               |               |       |                             |                |            |
|------------------------------------|---------------------------------------------------------------|---------------|-------|-----------------------------|----------------|------------|
| Property Reference                 | 6381-SUST-105W-HAMPTON PARK                                   |               |       |                             | Issued on Date | 04/11/2025 |
| Assessment Reference               | 00001 WITH PV                                                 | Prop Type Ref |       | 6381-SUST-105W-HAMPTON PARK |                |            |
| Property                           | Land adjacent to, 36, Hampton Park, Cotham, Bristol , BS6 6LH |               |       |                             |                |            |
|                                    |                                                               |               |       |                             |                |            |
| SAP Rating                         | 83 B                                                          | DER           | 4.06  | TER                         | 13.81          |            |
| Environmental                      | 97 A                                                          | % DER < TER   |       |                             |                | 70.60      |
| CO <sub>2</sub> Emissions (t/year) | 0.21                                                          | DFEE          | 49.52 | TFEE                        | 55.67          |            |
| Compliance Check                   | See BREL                                                      | % DFEE < TFEE |       |                             |                | 11.04      |
| % DPER < TPER                      | 34.50                                                         | DPER          | 48.04 | TPER                        | 73.34          |            |
|                                    |                                                               |               |       |                             |                |            |
| Assessor Details                   |                                                               |               |       |                             | Assessor ID    | N388-0001  |
| Client                             | 105 West Architects Ltd, 105 West Architects Ltd              |               |       |                             |                |            |

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)  
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

## 1. Overall dwelling characteristics

|                                                        | Area<br>(m <sup>2</sup> ) | Storey height<br>(m)            | Volume<br>(m <sup>3</sup> ) |
|--------------------------------------------------------|---------------------------|---------------------------------|-----------------------------|
| Main dwelling                                          |                           |                                 |                             |
| Ground floor                                           | 59.3700 (1b)              | x 2.4500 (2b)                   | = 145.4565 (1b) - (3b)      |
| First floor                                            | 8.1200 (1c)               | x 2.2000 (2c)                   | = 17.8640 (1c) - (3c)       |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 67.4900                   |                                 | (4)                         |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 163.3205 (5)              |

## 2. Ventilation rate

|                                                                                                         | m <sup>3</sup> per hour                                                         |        |        |        |        |        |        |        |        |        |        |        |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Number of open chimneys                                                                                 | 0 * 80 = 0.0000 (6a)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Number of open flues                                                                                    | 0 * 20 = 0.0000 (6b)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Number of chimneys / flues attached to closed fire                                                      | 0 * 10 = 0.0000 (6c)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Number of flues attached to solid fuel boiler                                                           | 0 * 20 = 0.0000 (6d)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Number of flues attached to other heater                                                                | 0 * 35 = 0.0000 (6e)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Number of blocked chimneys                                                                              | 0 * 20 = 0.0000 (6f)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Number of intermittent extract fans                                                                     | 0 * 10 = 0.0000 (7a)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Number of passive vents                                                                                 | 0 * 10 = 0.0000 (7b)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Number of flueless gas fires                                                                            | 0 * 40 = 0.0000 (7c)                                                            |        |        |        |        |        |        |        |        |        |        |        |
| Infiltration due to chimneys, flues and fans                                                            | = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8) |        |        |        |        |        |        |        |        |        |        |        |
| Pressure test                                                                                           | Yes                                                                             |        |        |        |        |        |        |        |        |        |        |        |
| Pressure Test Method                                                                                    | Blower Door                                                                     |        |        |        |        |        |        |        |        |        |        |        |
| Measured/design AP50                                                                                    | 3.0000 (17)                                                                     |        |        |        |        |        |        |        |        |        |        |        |
| Infiltration rate                                                                                       | 0.1500 (18)                                                                     |        |        |        |        |        |        |        |        |        |        |        |
| Number of sides sheltered                                                                               | 2 (19)                                                                          |        |        |        |        |        |        |        |        |        |        |        |
| Shelter factor                                                                                          | (20) = 1 - [0.075 x (19)] = 0.8500 (20)                                         |        |        |        |        |        |        |        |        |        |        |        |
| Infiltration rate adjusted to include shelter factor                                                    | (21) = (18) x (20) = 0.1275 (21)                                                |        |        |        |        |        |        |        |        |        |        |        |
| Wind speed                                                                                              | Jan                                                                             | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec    |
| Wind factor                                                                                             | 5.1000                                                                          | 5.0000 | 4.9000 | 4.4000 | 4.3000 | 3.8000 | 3.8000 | 3.7000 | 4.0000 | 4.3000 | 4.5000 | 4.7000 |
| Adj infilt rate                                                                                         | 1.2750                                                                          | 1.2500 | 1.2250 | 1.1000 | 1.0750 | 0.9500 | 0.9500 | 0.9250 | 1.0000 | 1.0750 | 1.1250 | 1.1750 |
| Balanced mechanical ventilation with heat recovery                                                      | 0.1626                                                                          | 0.1594 | 0.1562 | 0.1403 | 0.1371 | 0.1211 | 0.1211 | 0.1179 | 0.1275 | 0.1371 | 0.1434 | 0.1498 |
| If mechanical ventilation                                                                               | 0.5000 (23a)                                                                    |        |        |        |        |        |        |        |        |        |        |        |
| If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) | 0.5000 (23b)                                                                    |        |        |        |        |        |        |        |        |        |        |        |
| If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =            | 72.0000 (23c)                                                                   |        |        |        |        |        |        |        |        |        |        |        |
| Effective ac                                                                                            | 0.3026                                                                          | 0.2994 | 0.2962 | 0.2802 | 0.2771 | 0.2611 | 0.2611 | 0.2579 | 0.2675 | 0.2771 | 0.2834 | 0.2898 |

## 3. Heat losses and heat loss parameter

| Element                                                     | Gross<br>m <sup>2</sup> | Openings<br>m <sup>2</sup> | NetArea<br>m <sup>2</sup> | U-value<br>W/m <sup>2</sup> K | A x U<br>W/K | K-value<br>kJ/m <sup>2</sup> K | A x K<br>kJ/K    |
|-------------------------------------------------------------|-------------------------|----------------------------|---------------------------|-------------------------------|--------------|--------------------------------|------------------|
| Main dwelling                                               |                         |                            |                           |                               |              |                                |                  |
| Entrance door                                               |                         |                            | 1.9400                    | 1.4000                        | 2.7160       |                                | (26)             |
| Glazed door & window                                        |                         |                            | 11.1200                   | 1.1450                        | 12.7328      |                                | (27)             |
| Roof light                                                  |                         |                            | 1.8400                    | 1.2357                        | 2.2738       |                                | (27a)            |
| Roof window                                                 |                         |                            | 1.1600                    | 1.2357                        | 1.4335       |                                | (27a)            |
| Heatloss Floor GF                                           |                         |                            | 59.4000                   | 0.1300                        | 7.7220       | 117.0000                       | 6949.8000 (28a)  |
| External Wall 1                                             | 113.9000                | 13.0600                    | 100.8400                  | 0.1400                        | 14.1176      | 181.8000                       | 18332.7120 (29a) |
| External Roof FLAT                                          | 49.2000                 | 1.8400                     | 47.3600                   | 0.1500                        | 7.1040       | 9.0000                         | 426.2400 (30)    |
| External Roof RAFTER                                        | 9.0000                  | 1.1600                     | 7.8400                    | 0.1500                        | 1.1760       | 9.0000                         | 70.5600 (30)     |
| Total net area of external elements Aum(A, m <sup>2</sup> ) |                         |                            | 231.5000                  |                               |              |                                | (31)             |
| Fabric heat loss, W/K = Sum (A x U)                         |                         |                            |                           | (26)...(30) + (32) =          | 49.2756      |                                | (33)             |
| Main dwelling                                               |                         |                            |                           |                               |              |                                |                  |
| Internal Wall 1                                             |                         |                            | 68.7600                   |                               |              | 100.0000                       | 6876.0000 (32c)  |
| Internal Floor 1                                            |                         |                            | 8.1200                    |                               |              | 18.0000                        | 146.1600 (32d)   |
| Internal Ceiling 1                                          |                         |                            | 8.1200                    |                               |              | 9.0000                         | 73.0800 (32e)    |

# Full SAP Calculation Printout



Heat capacity  $C_m = \text{Sum}(A \times k)$

Thermal mass parameter (TMP =  $C_m / \text{TFA}$ ) in  $\text{kJ/m}^2\text{K}$

List of Thermal Bridges

|                                                                  |
|------------------------------------------------------------------|
| K1 Element                                                       |
| E1 Steel lintel with perforated steel base plate                 |
| E3 Sill                                                          |
| E4 Jamb                                                          |
| E5 Ground floor (normal)                                         |
| E6 Intermediate floor within a dwelling                          |
| E16 Corner (normal)                                              |
| R1 Head of roof window                                           |
| R2 Sill of roof window                                           |
| R3 Jamb of roof window                                           |
| R11 Upstands or kerbs of rooflights                              |
| E11 Eaves (insulation at rafter level)                           |
| E13 Gable (insulation at rafter level)                           |
| E14 Flat roof                                                    |
| E17 Corner (inverted - internal area greater than external area) |
| R7 Flat ceiling (inverted)                                       |

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

Point Thermal bridges

Total fabric heat loss

$$(28) \dots (30) + (32) + (32a) \dots (32e) = 32874.5520 \quad (34)$$

$$487.1026 \quad (35)$$

| Length  | Psi-value | Total   |
|---------|-----------|---------|
| 7.5500  | 0.2860    | 2.1593  |
| 3.4500  | 0.0300    | 0.1035  |
| 20.6800 | 0.0240    | 0.4963  |
| 36.0600 | 0.0450    | 1.6227  |
| 9.1600  | 0.0010    | 0.0092  |
| 23.7300 | 0.0500    | 1.1865  |
| 0.8000  | 0.2400    | 0.1920  |
| 0.8000  | 0.2400    | 0.1920  |
| 2.9000  | 0.2400    | 0.6960  |
| 7.8000  | 0.2400    | 1.8720  |
| 4.4300  | 0.0210    | 0.0930  |
| 4.9300  | 0.0380    | 0.1873  |
| 30.7200 | 0.0500    | 1.5360  |
| 2.4500  | -0.0650   | -0.1593 |
| 0.0000  | 0.1200    | 0.0000  |

$$(36a) = 10.1866 \quad (36)$$

$$(33) + (36) + (36a) = 59.4622 \quad (37)$$

Ventilation heat loss calculated monthly (38)m =  $0.33 \times (25)\text{m} \times (5)$

|                           | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |         |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| (38)m                     | 16.3068 | 16.1350 | 15.9633 | 15.1043 | 14.9325 | 14.0735 | 14.0735 | 13.9017 | 14.4171 | 14.9325 | 15.2761 | 15.6197 | (38)    |
| Heat transfer coeff       | 75.7691 | 75.5973 | 75.4255 | 74.5665 | 74.3947 | 73.5358 | 73.5358 | 73.3640 | 73.8794 | 74.3947 | 74.7383 | 75.0819 | (39)    |
| Average = Sum(39)m / 12 = |         |         |         |         |         |         |         |         |         |         |         |         | 74.5236 |

|               | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec    |      |
|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| HLP           | 1.1227 | 1.1201 | 1.1176 | 1.1049 | 1.1023 | 1.0896 | 1.0896 | 1.0870 | 1.0947 | 1.1023 | 1.1074 | 1.1125 | (40) |
| HLP (average) |        |        |        |        |        |        |        |        |        |        |        | 1.1042 |      |
| Days in month | 31     | 28     | 31     | 30     | 31     | 30     | 31     | 31     | 30     | 31     | 30     | 31     |      |

## 4. Water heating energy requirements (kWh/year)

Assumed occupancy

Hot water usage for mixer showers 2.1837 (42)

Hot water usage for baths 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for other uses 26.2833 25.8930 25.3433 24.3297 23.5708 22.7293 22.2748 22.8206 23.4149 24.3154 25.3498 26.1944 (42b)

Average daily hot water use (litres/day) 36.9931 35.6479 34.3027 32.9575 31.6123 30.2671 30.2671 31.6123 32.9575 34.3027 35.6479 36.9931 (42c)

57.9988 (43)

|                                                      | Jan      | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |      |
|------------------------------------------------------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| Daily hot water use                                  | 63.2764  | 61.5408 | 59.6459 | 57.2872 | 55.1831 | 52.9964 | 52.5418 | 54.4329 | 56.3724 | 58.6180 | 60.9976 | 63.1875 | (44) |
| Energy content                                       | 100.2143 | 87.6333 | 91.6736 | 78.4233 | 74.2870 | 65.1652 | 63.5448 | 67.3993 | 69.5128 | 79.5441 | 86.9023 | 98.9364 | (45) |
| Energy content (annual)                              |          |         |         |         |         |         |         |         |         |         |         |         |      |
| Distribution loss (46)m = $0.15 \times (45)\text{m}$ | 15.0321  | 13.1450 | 13.7510 | 11.7635 | 11.1431 | 9.7748  | 9.5317  | 10.1099 | 10.4269 | 11.9316 | 13.0353 | 14.8405 | (46) |

Water storage loss: 150.0000 (47)

Store volume 1.8000 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss

30.1320 27.2160 30.1320 29.1600 30.1320 29.1600 30.1320 30.1320 29.1600 30.1320 29.1600 30.1320 30.1320 (56)

If cylinder contains dedicated solar storage

30.1320 27.2160 30.1320 29.1600 30.1320 29.1600 30.1320 30.1320 29.1600 30.1320 29.1600 30.1320 30.1320 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

153.6087 135.8605 145.0680 130.0953 127.6814 116.8372 116.9392 120.7937 121.1848 132.9385 138.5743 152.3308 (62)

WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)

PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)

Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)

FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

Output from w/h 153.6087 135.8605 145.0680 130.0953 127.6814 116.8372 116.9392 120.7937 121.1848 132.9385 138.5743 152.3308 (64)

Total per year (kWh/year) = Sum(64)m = 1591.9124 (64)

1592 (64)

12Total per year (kWh/year)

Electric shower(s) 52.3838 46.6744 50.9666 48.6368 49.5495 47.2654 48.8409 49.5495 48.6368 50.9666 50.0082 52.3838 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 595.8622 (64a)

Heat gains from water heating, kWh/month 89.1327 79.3884 85.9386 79.5726 79.8033 74.8214 76.0544 77.5131 76.6098 81.9056 82.7347 88.7078 (65)

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

| Metabolic gains (Table 5), Watts                                                    | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec      |      |
|-------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| (66)m                                                                               | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 96.5832  | 106.9314 | 96.5832  | 99.8026  | 96.5832  | 99.8026  | 96.5832  | 96.5832  | 99.8026  | 96.5832  | 99.8026  | 96.5832  | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 191.3694 | 193.3553 | 188.3511 | 177.6977 | 164.2498 | 151.6107 | 143.1669 | 141.1811 | 146.1853 | 156.8386 | 170.2866 | 182.9257 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | (69) |
| Pumps, fans                                                                         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (70) |
| Losses e.g. evaporation (negative values) (Table 5)                                 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | (71) |
| Water heating gains (Table 5)                                                       | 119.8020 | 118.1375 | 115.5089 | 110.5174 | 107.2625 | 103.9186 | 102.2236 | 104.1843 | 106.4025 | 110.0882 | 114.9093 | 119.2309 | (72) |
| Total internal gains                                                                | 463.5099 | 474.1794 | 456.1984 | 443.7730 | 423.8507 | 411.0871 | 397.7290 | 397.7038 | 408.1457 | 419.2652 | 440.7537 | 454.4950 | (73) |

## 6. Solar gains

# Full SAP Calculation Printout



| [Jan]      |  | Area<br>m2 | Solar flux<br>Table 6a<br>W/m2 | g<br>Specific data<br>or Table 6b | FF<br>Specific data<br>or Table 6c | Access<br>factor<br>Table 6d | Gains<br>W   |
|------------|--|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|--------------|
| North      |  | 0.5700     | 10.6334                        | 0.6300                            | 0.7000                             | 0.7700                       | 1.8523 (74)  |
| East       |  | 10.5500    | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       | 63.3245 (76) |
| Horizontal |  | 1.8400     | 26.0000                        | 0.5000                            | 0.7000                             | 1.0000                       | 15.0696 (82) |
| East       |  | 1.1600     | 26.5849                        | 0.5000                            | 0.7000                             | 1.0000                       | 9.7141 (82)  |

|             |          |          |          |          |          |          |          |          |          |          |          |               |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| Solar gains | 89.9605  | 178.3387 | 299.5388 | 446.0035 | 554.7075 | 571.4330 | 542.5521 | 460.6123 | 351.3529 | 213.1510 | 112.5937 | 73.7082 (83)  |
| Total gains | 553.4704 | 652.5181 | 755.7372 | 889.7765 | 978.5582 | 982.5201 | 940.2811 | 858.3161 | 759.4986 | 632.4162 | 553.3473 | 528.2033 (84) |

## 7. Mean internal temperature (heating season)

|                                                                             |          |          |          |          |          |          |          |          |                           |          |          |              |
|-----------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|---------------------------|----------|----------|--------------|
| Temperature during heating periods in the living area from Table 9, Th1 (C) |          |          |          |          |          |          |          |          |                           |          |          | 21.0000 (85) |
| Utilisation factor for gains for living area, nil,m (see Table 9a)          |          |          |          |          |          |          |          |          |                           |          |          |              |
|                                                                             | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep                       | Oct      | Nov      | Dec          |
| tau                                                                         | 120.5217 | 120.7956 | 121.0707 | 122.4654 | 122.7482 | 124.1820 | 124.1820 | 124.4728 | 123.6045                  | 122.7482 | 122.1839 | 121.6248     |
| alpha                                                                       | 9.0348   | 9.0530   | 9.0714   | 9.1644   | 9.1832   | 9.2788   | 9.2788   | 9.2982   | 9.2403                    | 9.1832   | 9.1456   | 9.1083       |
| util living area                                                            | 0.9997   | 0.9984   | 0.9889   | 0.9078   | 0.6982   | 0.4787   | 0.3441   | 0.3931   | 0.6656                    | 0.9671   | 0.9985   | 0.9998 (86)  |
| Living                                                                      | 20.4794  | 20.5793  | 20.7291  | 20.9013  | 20.9601  | 20.9662  | 20.9664  | 20.9665  | 20.9633                   | 20.8552  | 20.6334  | 20.4646      |
| Non living                                                                  | 19.3817  | 19.5112  | 19.7011  | 19.9031  | 19.9525  | 19.9662  | 19.9663  | 19.9684  | 19.9609                   | 19.8638  | 19.5897  | 19.3700      |
| 24 / 16                                                                     | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0                         | 0        | 0        | 0            |
| 24 / 9                                                                      | 3        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0                         | 0        | 0        | 0            |
| 16 / 9                                                                      | 28       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0                         | 0        | 0        | 10           |
| MIT                                                                         | 20.7337  | 20.5793  | 20.7291  | 20.9013  | 20.9601  | 20.9662  | 20.9664  | 20.9665  | 20.9633                   | 20.8552  | 20.6334  | 20.5395 (87) |
| Th 2                                                                        | 19.9824  | 19.9844  | 19.9865  | 19.9969  | 19.9989  | 20.0094  | 20.0094  | 20.0114  | 20.0052                   | 19.9989  | 19.9948  | 19.9906 (88) |
| util rest of house                                                          | 0.9995   | 0.9973   | 0.9817   | 0.8658   | 0.6275   | 0.4048   | 0.2666   | 0.3087   | 0.5730                    | 0.9407   | 0.9973   | 0.9996 (89)  |
| MIT 2                                                                       | 19.7429  | 19.5112  | 19.7011  | 19.9031  | 19.9525  | 19.9662  | 19.9663  | 19.9684  | 19.9609                   | 19.8638  | 19.5897  | 19.4819 (90) |
| Living area fraction                                                        |          |          |          |          |          |          |          |          | fLA = Living area / (4) = |          |          |              |
| MIT                                                                         | 20.5343  | 20.3644  | 20.5222  | 20.7005  | 20.7574  | 20.7650  | 20.7652  | 20.7656  | 20.7616                   | 20.6557  | 20.4233  | 20.3267 (92) |
| Temperature adjustment                                                      |          |          |          |          |          |          |          |          |                           |          |          | 0.0000       |
| adjusted MIT                                                                | 20.5343  | 20.3644  | 20.5222  | 20.7005  | 20.7574  | 20.7650  | 20.7652  | 20.7656  | 20.7616                   | 20.6557  | 20.4233  | 20.3267 (93) |

## 8. Space heating requirement

|                                                                                |           |           |           |          |          |          |          |          |          |               |          |                |
|--------------------------------------------------------------------------------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|---------------|----------|----------------|
|                                                                                | Jan       | Feb       | Mar       | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct           | Nov      | Dec            |
| Utilisation                                                                    | 0.9996    | 0.9977    | 0.9860    | 0.8965   | 0.6815   | 0.4612   | 0.3257   | 0.3731   | 0.6438   | 0.9596        | 0.9979   | 0.9997 (94)    |
| Useful gains                                                                   | 553.2465  | 651.0442  | 745.1505  | 797.7026 | 666.8451 | 453.1622 | 306.2820 | 320.2597 | 488.9759 | 606.8919      | 552.2039 | 528.0475 (95)  |
| Ext temp.                                                                      | 4.3000    | 4.9000    | 6.5000    | 8.9000   | 11.7000  | 14.6000  | 16.6000  | 16.4000  | 14.1000  | 10.6000       | 7.1000   | 4.2000 (96)    |
| Heat loss rate W                                                               | 1230.0585 | 1169.0633 | 1057.6344 | 879.9209 | 673.8219 | 453.3489 | 306.2883 | 320.2807 | 492.1579 | 748.0904      | 995.7646 | 1210.8223 (97) |
| Space heating kWh                                                              | 503.5481  | 348.1088  | 232.4880  | 59.1972  | 5.1907   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 105.0516      | 319.3637 | 507.9845 (98a) |
| Space heating requirement - total per year (kWh/year)                          |           |           |           |          |          |          |          |          |          |               |          | 2080.9326      |
| Solar heating kWh                                                              | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000        | 0.0000   | 0.0000 (98b)   |
| Solar heating contribution - total per year (kWh/year)                         |           |           |           |          |          |          |          |          |          |               |          | 0.0000         |
| Space heating kWh                                                              | 503.5481  | 348.1088  | 232.4880  | 59.1972  | 5.1907   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 105.0516      | 319.3637 | 507.9845 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) |           |           |           |          |          |          |          |          |          |               |          | 2080.9326      |
| Space heating per m2                                                           |           |           |           |          |          |          |          |          |          | (98c) / (4) = |          | 30.8332 (99)   |

## 9a. Energy requirements - Individual heating systems, including micro-CHP

|                                                                                                      |          |          |          |          |          |          |          |          |          |          |          |                 |
|------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------------|
| Fraction of space heat from secondary/supplementary system (Table 11)                                |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (201)    |
| Fraction of space heat from main system(s)                                                           |          |          |          |          |          |          |          |          |          |          |          | 1.0000 (202)    |
| Efficiency of main space heating system 1 (in %)                                                     |          |          |          |          |          |          |          |          |          |          |          | 206.7922 (206)  |
| Efficiency of main space heating system 2 (in %)                                                     |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (207)    |
| Efficiency of secondary/supplementary heating system, %                                              |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (208)    |
|                                                                                                      | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec             |
| Space heating requirement                                                                            | 503.5481 | 348.1088 | 232.4880 | 59.1972  | 5.1907   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 105.0516 | 319.3637 | 507.9845 (98)   |
| Space heating efficiency (main heating system 1)                                                     | 206.7922 | 206.7922 | 206.7922 | 206.7922 | 206.7922 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 206.7922 | 206.7922 | 206.7922 (210)  |
| Space heating fuel (main heating system)                                                             | 243.5044 | 168.3375 | 112.4259 | 28.6264  | 2.5101   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 50.8006  | 154.4370 | 245.6497 (211)  |
| Space heating efficiency (main heating system 2)                                                     | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (212)    |
| Space heating fuel (main heating system 2)                                                           | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (213)    |
| Space heating fuel (secondary)                                                                       | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (215)    |
| Water heating                                                                                        |          |          |          |          |          |          |          |          |          |          |          |                 |
| Water heating requirement                                                                            | 153.6087 | 135.8605 | 145.0680 | 130.0953 | 127.6814 | 116.8372 | 116.9392 | 120.7937 | 121.1848 | 132.9385 | 138.5743 | 152.3308 (64)   |
| Efficiency of water heater                                                                           | 171.2135 | 171.2135 | 171.2135 | 171.2135 | 171.2135 | 171.2135 | 171.2135 | 171.2135 | 171.2135 | 171.2135 | 171.2135 | 171.2135 (216)  |
| Fuel for water heating, kWh/month                                                                    | 89.7176  | 79.3515  | 84.7293  | 75.9843  | 74.5744  | 68.2407  | 68.3002  | 70.5515  | 70.7799  | 77.6449  | 80.9366  | 88.9713 (219)   |
| Space cooling fuel requirement                                                                       | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (221)    |
| Pumps and Fa                                                                                         | 11.8459  | 10.6995  | 11.8459  | 11.4638  | 11.8459  | 11.4638  | 11.8459  | 11.8459  | 11.4638  | 11.8459  | 11.4638  | 11.8459 (231)   |
| Lighting                                                                                             | 23.1536  | 18.5747  | 16.7244  | 12.2530  | 9.4646   | 7.7327   | 8.6339   | 11.2227  | 14.5772  | 19.1261  | 21.6028  | 23.7971 (232)   |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        | -19.2513 | -32.7252 | -56.5439 | -71.8822 | -83.7626 | -81.0542 | -79.8296 | -71.2192 | -56.4139 | -40.0830 | -22.5753 | -15.8375 (233a) |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (234a)   |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)                  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235a)   |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235c)   |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        | -3.9615  | -10.8204 | -29.1649 | -57.7178 | -87.6550 | -91.7458 | -88.9096 | -68.9504 | -42.9461 | -18.8418 | -5.9367  | -2.9113 (233b)  |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                              |          |          |          |          |          |          |          |          |          |          |          |                 |

# Full SAP Calculation Printout



|                                                                                                      |        |        |        |        |        |        |        |        |        |        |        |            |        |
|------------------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|--------|
| (234b)m                                                                                              | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000     | (234b) |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)                  |        |        |        |        |        |        |        |        |        |        |        |            |        |
| (235b)m                                                                                              | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000     | (235b) |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) |        |        |        |        |        |        |        |        |        |        |        |            |        |
| (235d)m                                                                                              | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000     | (235d) |
| Annual totals kWh/year                                                                               |        |        |        |        |        |        |        |        |        |        |        |            |        |
| Space heating fuel - main system 1                                                                   |        |        |        |        |        |        |        |        |        |        |        | 1006.2916  | (211)  |
| Space heating fuel - main system 2                                                                   |        |        |        |        |        |        |        |        |        |        |        | 0.0000     | (213)  |
| Space heating fuel - secondary                                                                       |        |        |        |        |        |        |        |        |        |        |        | 0.0000     | (215)  |
| Efficiency of water heater                                                                           |        |        |        |        |        |        |        |        |        |        |        | 171.2135   |        |
| Water heating fuel used                                                                              |        |        |        |        |        |        |        |        |        |        |        | 929.7823   | (219)  |
| Space cooling fuel                                                                                   |        |        |        |        |        |        |        |        |        |        |        | 0.0000     | (221)  |
| Electricity for pumps and fans:                                                                      |        |        |        |        |        |        |        |        |        |        |        |            |        |
| (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 0.7000)                          |        |        |        |        |        |        |        |        |        |        |        |            |        |
| mechanical ventilation fans (SFP = 0.7000)                                                           |        |        |        |        |        |        |        |        |        |        |        | 139.4757   | (230a) |
| Total electricity for the above, kWh/year                                                            |        |        |        |        |        |        |        |        |        |        |        | 139.4757   | (231)  |
| Electricity for lighting (calculated in Appendix L)                                                  |        |        |        |        |        |        |        |        |        |        |        | 186.8629   | (232)  |
| Energy saving/generation technologies (Appendices M ,N and Q)                                        |        |        |        |        |        |        |        |        |        |        |        |            |        |
| PV generation                                                                                        |        |        |        |        |        |        |        |        |        |        |        | -1140.7392 | (233)  |
| Wind generation                                                                                      |        |        |        |        |        |        |        |        |        |        |        | 0.0000     | (234)  |
| Hydro-electric generation (Appendix N)                                                               |        |        |        |        |        |        |        |        |        |        |        | 0.0000     | (235a) |
| Electricity generated - Micro CHP (Appendix N)                                                       |        |        |        |        |        |        |        |        |        |        |        | 0.0000     | (235)  |
| Appendix Q - special features                                                                        |        |        |        |        |        |        |        |        |        |        |        |            |        |
| Energy saved or generated                                                                            |        |        |        |        |        |        |        |        |        |        |        | -0.0000    | (236)  |
| Energy used                                                                                          |        |        |        |        |        |        |        |        |        |        |        | 0.0000     | (237)  |
| Total delivered energy for all uses                                                                  |        |        |        |        |        |        |        |        |        |        |        | 1717.5355  | (238)  |

## 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

|                                                 | Energy<br>kWh/year | Emission factor<br>kg CO2/kWh | Emissions<br>kg CO2/year |        |
|-------------------------------------------------|--------------------|-------------------------------|--------------------------|--------|
| Space heating - main system 1                   | 1006.2916          | 0.1575                        | 158.5211                 | (261)  |
| Total CO2 associated with community systems     |                    |                               | 0.0000                   | (373)  |
| Water heating (other fuel)                      | 929.7823           | 0.1404                        | 130.5840                 | (264)  |
| Energy for instantaneous electric shower(s)     | 595.8622           | 0.1391                        | 82.8976                  | (264a) |
| Space and water heating                         |                    |                               | 289.1050                 | (265)  |
| Pumps, fans and electric keep-hot               | 139.4757           | 0.1387                        | 19.3470                  | (267)  |
| Energy for lighting                             | 186.8629           | 0.1443                        | 26.9701                  | (268)  |
| Energy saving/generation technologies           |                    |                               |                          |        |
| PV Unit electricity used in dwelling            | -631.1778          | 0.1319                        | -83.2493                 |        |
| PV Unit electricity exported                    | -509.5614          | 0.1203                        | -61.2927                 |        |
| Total                                           |                    |                               | -144.5420                | (269)  |
| Total CO2, kg/year                              |                    |                               | 273.7777                 | (272)  |
| EPC Dwelling Carbon Dioxide Emission Rate (DER) |                    |                               | 4.0600                   | (273)  |

## 13a. Primary energy - Individual heating systems including micro-CHP

|                                             | Energy<br>kWh/year | Primary energy factor<br>kg CO2/kWh | Primary energy<br>kWh/year |        |
|---------------------------------------------|--------------------|-------------------------------------|----------------------------|--------|
| Space heating - main system 1               | 1006.2916          | 1.5831                              | 1593.1094                  | (275)  |
| Total CO2 associated with community systems |                    |                                     | 0.0000                     | (473)  |
| Water heating (other fuel)                  | 929.7823           | 1.5193                              | 1412.6129                  | (278)  |
| Energy for instantaneous electric shower(s) | 595.8622           | 1.5143                              | 902.3345                   | (278a) |
| Space and water heating                     |                    |                                     | 3005.7224                  | (279)  |
| Pumps, fans and electric keep-hot           | 139.4757           | 1.5128                              | 210.9988                   | (281)  |
| Energy for lighting                         | 186.8629           | 1.5338                              | 286.6165                   | (282)  |
| Energy saving/generation technologies       |                    |                                     |                            |        |
| PV Unit electricity used in dwelling        | -631.1778          | 1.4873                              | -938.7631                  |        |
| PV Unit electricity exported                | -509.5614          | 0.4413                              | -224.8553                  |        |
| Total                                       |                    |                                     | -1163.6184                 | (283)  |
| Total Primary energy kWh/year               |                    |                                     | 3242.0538                  | (286)  |
| Dwelling Primary energy Rate (DPER)         |                    |                                     | 48.0400                    | (287)  |

## SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

### 1. Overall dwelling characteristics

|                                                        |         | Area<br>(m2) | Storey height<br>(m)            | Volume<br>(m3)         |  |
|--------------------------------------------------------|---------|--------------|---------------------------------|------------------------|--|
| Main dwelling                                          |         |              |                                 |                        |  |
| Ground floor                                           |         | 59.3700 (1b) | x 2.4500 (2b)                   | = 145.4565 (1b) - (3b) |  |
| First floor                                            |         | 8.1200 (1c)  | x 2.2000 (2c)                   | = 17.8640 (1c) - (3c)  |  |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 67.4900 |              |                                 | (4)                    |  |
| Dwelling volume                                        |         |              | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 163.3205 (5)         |  |

### 2. Ventilation rate

|                                                    | m3 per hour |              |
|----------------------------------------------------|-------------|--------------|
| Number of open chimneys                            | 0 * 80 =    | 0.0000 (6a)  |
| Number of open flues                               | 0 * 20 =    | 0.0000 (6b)  |
| Number of chimneys / flues attached to closed fire | 0 * 10 =    | 0.0000 (6c)  |
| Number of flues attached to solid fuel boiler      | 0 * 20 =    | 0.0000 (6d)  |
| Number of flues attached to other heater           | 0 * 35 =    | 0.0000 (6e)  |
| Number of blocked chimneys                         | 0 * 20 =    | 0.0000 (6f)  |
| Number of intermittent extract fans                | 2 * 10 =    | 20.0000 (7a) |

# Full SAP Calculation Printout



Number of passive vents  
Number of flueless gas fires

0 \* 10 = 0.0000 (7b)  
0 \* 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =  
Pressure test  
Pressure Test Method  
Measured/design AP50  
Infiltration rate  
Number of sides sheltered

Air changes per hour  
20.0000 / (5) = 0.1225 (8)  
Yes  
Blower Door  
5.0000 (17)  
0.3725 (18)  
2 (19)

Shelter factor  
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)  
(21) = (18) x (20) = 0.3166 (21)

|                 | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec    |       |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| Wind speed      | 5.1000 | 5.0000 | 4.9000 | 4.4000 | 4.3000 | 3.8000 | 3.8000 | 3.7000 | 4.0000 | 4.3000 | 4.5000 | 4.7000 | (22)  |
| Wind factor     | 1.2750 | 1.2500 | 1.2250 | 1.1000 | 1.0750 | 0.9500 | 0.9500 | 0.9250 | 1.0000 | 1.0750 | 1.1250 | 1.1750 | (22a) |
| Adj infilt rate |        |        |        |        |        |        |        |        |        |        |        |        |       |
| Effective ac    | 0.4037 | 0.3957 | 0.3878 | 0.3482 | 0.3403 | 0.3008 | 0.3008 | 0.2928 | 0.3166 | 0.3403 | 0.3562 | 0.3720 | (22b) |
|                 | 0.5815 | 0.5783 | 0.5752 | 0.5606 | 0.5579 | 0.5452 | 0.5452 | 0.5429 | 0.5501 | 0.5579 | 0.5634 | 0.5692 | (25)  |

## 3. Heat losses and heat loss parameter

| Element                                        | Gross<br>m2 | Openings<br>m2 | NetArea<br>m2 | U-value<br>W/m2K | A x U<br>W/K                 | K-value<br>kJ/m2K | A x K<br>kJ/K |       |
|------------------------------------------------|-------------|----------------|---------------|------------------|------------------------------|-------------------|---------------|-------|
| Main dwelling                                  |             |                |               |                  |                              |                   |               |       |
| TER Opaque door                                |             |                | 1.9400        | 1.0000           | 1.9400                       |                   |               | (26)  |
| TER Opening Type                               |             |                | 11.1200       | 1.1450           | 12.7328                      |                   |               | (27)  |
| TER Roof Window                                |             |                | 1.1600        | 1.1450           | 1.3281                       |                   |               | (27a) |
| TER Roof Light                                 |             |                | 1.8400        | 1.5918           | 2.9292                       |                   |               | (27a) |
| Heatloss Floor GF                              |             |                | 59.4000       | 0.1300           | 7.7220                       |                   |               | (28a) |
| External Wall 1                                | 113.9000    | 13.0600        | 100.8400      | 0.1800           | 18.1512                      |                   |               | (29a) |
| External Roof FLAT                             | 49.2000     | 1.8400         | 47.3600       | 0.1100           | 5.2096                       |                   |               | (30)  |
| External Roof RAFTER                           | 9.0000      | 1.1600         | 7.8400        | 0.1100           | 0.8624                       |                   |               | (30)  |
| Total net area of external elements Aum(A, m2) |             |                | 231.5000      |                  |                              |                   |               | (31)  |
| Fabric heat loss, W/K = Sum (A x U)            |             |                |               |                  | (26)...(30) + (32) = 52.0830 |                   |               | (33)  |

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

487.1026 (35)

List of Thermal Bridges

| K1 Element                                                       | Length  | Psi-value | Total   |                       |
|------------------------------------------------------------------|---------|-----------|---------|-----------------------|
| E1 Steel lintel with perforated steel base plate                 | 7.5500  | 0.0500    | 0.3775  |                       |
| E3 Sill                                                          | 3.4500  | 0.0500    | 0.1725  |                       |
| E4 Jamb                                                          | 20.6800 | 0.0500    | 1.0340  |                       |
| E5 Ground floor (normal)                                         | 36.0600 | 0.1600    | 5.7696  |                       |
| E6 Intermediate floor within a dwelling                          | 9.1600  | 0.0000    | 0.0000  |                       |
| E16 Corner (normal)                                              | 23.7300 | 0.0900    | 2.1357  |                       |
| R1 Head of roof window                                           | 0.8000  | 0.0800    | 0.0640  |                       |
| R2 Sill of roof window                                           | 0.8000  | 0.0600    | 0.0480  |                       |
| R3 Jamb of roof window                                           | 2.9000  | 0.0800    | 0.2320  |                       |
| R11 Upstands or kerbs of rooflights                              | 7.8000  | 0.0800    | 0.6240  |                       |
| E11 Eaves (insulation at rafter level)                           | 4.4300  | 0.0400    | 0.1772  |                       |
| E13 Gable (insulation at rafter level)                           | 4.9300  | 0.0800    | 0.3944  |                       |
| E14 Flat roof                                                    | 30.7200 | 0.0800    | 2.4576  |                       |
| E17 Corner (inverted - internal area greater than external area) | 2.4500  | -0.0900   | -0.2205 |                       |
| R7 Flat ceiling (inverted)                                       | 0.0000  | 0.0400    | 0.0000  |                       |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)       |         |           | 13.2660 | (36)                  |
| Point Thermal bridges                                            |         |           | 0.0000  | (36a) =               |
| Total fabric heat loss                                           |         |           | 65.3490 | (33) + (36) + (36a) = |

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

|                           | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |      |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| (38)m                     | 31.3386 | 31.1681 | 31.0010 | 30.2160 | 30.0692 | 29.3855 | 29.3855 | 29.2589 | 29.6488 | 30.0692 | 30.3663 | 30.6769 | (38) |
| Heat transfer coeff       | 96.6876 | 96.5171 | 96.3500 | 95.5650 | 95.4182 | 94.7345 | 94.7345 | 94.6079 | 94.9978 | 95.4182 | 95.7153 | 96.0259 | (39) |
| Average = Sum(39)m / 12 = |         |         |         |         |         |         |         |         |         |         |         | 95.5643 |      |

|               | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec    |      |
|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| HLP           | 1.4326 | 1.4301 | 1.4276 | 1.4160 | 1.4138 | 1.4037 | 1.4037 | 1.4018 | 1.4076 | 1.4138 | 1.4182 | 1.4228 | (40) |
| HLP (average) |        |        |        |        |        |        |        |        |        |        |        | 1.4160 |      |
| Days in mont  | 31     | 28     | 31     | 30     | 31     | 30     | 31     | 31     | 30     | 31     | 30     | 31     |      |

## 4. Water heating energy requirements (kWh/year)

|                                                                 |          |          |          |          |          |          |          |          |          |          |          |          |          |      |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| Assumed occupancy                                               |          |          |          |          |          |          |          |          |          |          |          |          | 2.1837   | (42) |
| Hot water usage for mixer showers                               | 60.8328  | 59.9186  | 58.5864  | 56.0375  | 54.1565  | 52.0589  | 50.8666  | 52.1886  | 53.6379  | 55.8901  | 58.4938  | 60.5997  | (42a)    |      |
| Hot water usage for baths                                       | 26.2833  | 25.8930  | 25.3433  | 24.3297  | 23.5708  | 22.7293  | 22.2748  | 22.8206  | 23.4149  | 24.3154  | 25.3498  | 26.1944  | (42b)    |      |
| Hot water usage for other uses                                  | 36.9931  | 35.6479  | 34.3027  | 32.9575  | 31.6123  | 30.2671  | 30.2671  | 31.6123  | 32.9575  | 34.3027  | 35.6479  | 36.9931  | (42c)    |      |
| Average daily hot water use (litres/day)                        |          |          |          |          |          |          |          |          |          |          |          |          | 114.0846 | (43) |
|                                                                 | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec      |          |      |
| Daily hot water use                                             | 124.1091 | 121.4594 | 118.2323 | 113.3247 | 109.3396 | 105.0552 | 103.4084 | 106.6215 | 110.0103 | 114.5082 | 119.4914 | 123.7872 | (44)     |      |
| Energy content (annual)                                         | 196.5585 | 172.9565 | 181.7187 | 155.1359 | 147.1922 | 129.1777 | 125.0635 | 132.0197 | 135.6537 | 155.3865 | 170.2374 | 193.8208 | (45)     |      |
| Distribution loss (46)m = 0.15 x (45)m                          | 29.4838  | 25.9435  | 27.2578  | 23.2704  | 22.0788  | 19.3767  | 18.7595  | 19.8030  | 20.3481  | 23.3080  | 25.5356  | 29.0731  | (46)     |      |
| Water storage loss:                                             |          |          |          |          |          |          |          |          |          |          |          |          |          |      |
| Store volume                                                    |          |          |          |          |          |          |          |          |          |          |          |          | 150.0000 | (47) |
| a) If manufacturer declared loss factor is known (kWh/day):     |          |          |          |          |          |          |          |          |          |          |          |          | 1.3938   | (48) |
| Temperature factor from Table 2b                                |          |          |          |          |          |          |          |          |          |          |          |          | 0.5400   | (49) |
| Enter (49) or (54) in (55)                                      |          |          |          |          |          |          |          |          |          |          |          |          | 0.7527   | (55) |
| Total storage loss                                              | 23.3325  | 21.0745  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | (56)     |      |
| If cylinder contains dedicated solar storage                    | 23.3325  | 21.0745  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | (57)     |      |
| Primary loss                                                    | 23.2624  | 21.0112  | 23.2624  | 22.5120  | 23.2624  | 22.5120  | 23.2624  | 23.2624  | 22.5120  | 23.2624  | 22.5120  | 23.2624  | (59)     |      |
| Combi loss                                                      | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (61)     |      |
| Total heat required for water heating calculated for each month | 243.1534 | 215.0422 | 228.3136 | 200.2277 | 193.7871 | 174.2695 | 171.6584 | 178.6146 | 180.7455 | 201.9814 | 215.3292 | 240.4157 | (62)     |      |
| WWHRS                                                           | -27.8102 | -24.5956 | -25.7551 | -21.3262 | -19.8753 | -17.0074 | -15.9417 | -16.9524 | -17.5965 | -20.7443 | -23.5008 | -27.2952 | (63a)    |      |
| PV diverter                                                     | -0.0000  | -0.0000  | -0.0000  | -0.0000  | -0.0000  | -0.0000  | -0.0000  | -0.0000  | -0.0000  | -0.0000  | -0.0000  | -0.0000  | (63b)    |      |

# Full SAP Calculation Printout



|                                          |                                        |          |          |          |          |          |          |          |          |          |          |           |       |
|------------------------------------------|----------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------|
| Solar input                              | 0.0000                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | (63c) |
| FGHRS                                    | 0.0000                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | (63d) |
| Output from w/h                          | 215.3432                               | 190.4467 | 202.5585 | 178.9015 | 173.9118 | 157.2621 | 155.7167 | 161.6622 | 163.1490 | 181.2371 | 191.8284 | 213.1205  | (64)  |
| 12Total per year (kWh/year)              | Total per year (kWh/year) = Sum(64)m = |          |          |          |          |          |          |          |          |          |          | 2185.1377 | (64)  |
| Electric shower(s)                       | 0.0000                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | (64a) |
| Heat gains from water heating, kWh/month | 102.6316                               | 91.1766  | 97.6974  | 87.6562  | 86.2173  | 79.0251  | 78.8595  | 81.1725  | 81.1783  | 88.9419  | 92.6774  | 101.7213  | (65)  |

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

|                                                                                     |          |          |          |          |          |          |          |          |          |          |          |          |      |
|-------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| Metabolic gains (Table 5), Watts                                                    | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec      |      |
| (66m)                                                                               | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | 109.1840 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 96.5832  | 106.9314 | 96.5832  | 99.8026  | 96.5832  | 99.8026  | 96.5832  | 96.5832  | 99.8026  | 96.5832  | 99.8026  | 96.5832  | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 191.3694 | 193.3553 | 188.3511 | 177.6977 | 164.2498 | 151.6107 | 143.1669 | 141.1811 | 146.1853 | 156.8386 | 170.2866 | 182.9257 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | 33.9184  | (69) |
| Pumps, fans                                                                         | 3.0000   | 3.0000   | 3.0000   | 3.0000   | 3.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 3.0000   | 3.0000   | 3.0000   | (70) |
| Losses e.g. evaporation (negative values) (Table 5)                                 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | -87.3472 | (71) |
| Water heating gains (Table 5)                                                       | 137.9457 | 135.6795 | 131.3137 | 121.7447 | 115.8835 | 109.7570 | 105.9940 | 109.1028 | 112.7477 | 119.5456 | 128.7186 | 136.7222 | (72) |
| Total internal gains                                                                | 484.6536 | 494.7213 | 475.0031 | 458.0002 | 435.4717 | 416.9255 | 401.4993 | 402.6223 | 414.4908 | 431.7227 | 457.5630 | 474.9863 | (73) |

## 6. Solar gains

| [Jan]       |          |          | Area<br>m2 | Solar flux<br>Table 6a<br>W/m2 | g<br>Specific data<br>or Table 6b | FF<br>Specific data<br>or Table 6c | Access<br>factor<br>Table 6d | Gains<br>W   |          |          |          |          |      |
|-------------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|--------------|----------|----------|----------|----------|------|
| North       |          |          | 0.5700     | 10.6334                        | 0.6300                            | 0.7000                             | 0.7700                       | 1.8523 (74)  |          |          |          |          |      |
| East        |          |          | 10.5500    | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       | 63.3245 (76) |          |          |          |          |      |
| East        |          |          | 1.1600     | 26.5849                        | 0.6300                            | 0.7000                             | 1.0000                       | 12.2398 (82) |          |          |          |          |      |
| Horizontal  |          |          | 1.8400     | 26.0000                        | 0.6300                            | 0.7000                             | 1.0000                       | 18.9877 (82) |          |          |          |          |      |
| Solar gains | 96.4043  | 191.5786 | 322.8134   | 482.0942                       | 600.7422                          | 619.3329                           | 587.8378                     | 498.3217     | 379.1347 | 229.2574 | 120.7448 | 78.9314  | (83) |
| Total gains | 581.0578 | 686.2999 | 797.8165   | 940.0945                       | 1036.2139                         | 1036.2584                          | 989.3371                     | 900.9440     | 793.6255 | 660.9801 | 578.3078 | 553.9177 | (84) |

## 7. Mean internal temperature (heating season)

|                                                                             |                           |         |         |         |         |         |         |         |         |         |         |         |      |
|-----------------------------------------------------------------------------|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| Temperature during heating periods in the living area from Table 9, Th1 (C) |                           |         |         |         |         |         |         |         |         |         |         | 21.0000 | (85) |
| Utilisation factor for gains for living area, nil,m (see Table 9a)          | Jan                       | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |      |
| tau                                                                         | 94.4466                   | 94.6135 | 94.7776 | 95.5561 | 95.7032 | 96.3938 | 96.3938 | 96.5228 | 96.1266 | 95.7032 | 95.4061 | 95.0975 |      |
| alpha                                                                       | 7.2964                    | 7.3076  | 7.3185  | 7.3704  | 7.3802  | 7.4263  | 7.4263  | 7.4349  | 7.4084  | 7.3802  | 7.3604  | 7.3398  |      |
| util living area                                                            | 0.9996                    | 0.9986  | 0.9928  | 0.9506  | 0.8025  | 0.5805  | 0.4209  | 0.4819  | 0.7823  | 0.9828  | 0.9988  | 0.9997  | (86) |
| MIT                                                                         | 20.0884                   | 20.2339 | 20.4663 | 20.7680 | 20.9507 | 20.9958 | 20.9997 | 20.9991 | 20.9694 | 20.6972 | 20.3352 | 20.0648 | (87) |
| Th 2                                                                        | 19.7384                   | 19.7403 | 19.7422 | 19.7511 | 19.7528 | 19.7605 | 19.7605 | 19.7619 | 19.7575 | 19.7528 | 19.7494 | 19.7459 | (88) |
| util rest of house                                                          | 0.9994                    | 0.9976  | 0.9877  | 0.9190  | 0.7186  | 0.4708  | 0.3026  | 0.3529  | 0.6646  | 0.9656  | 0.9977  | 0.9996  | (89) |
| MIT 2                                                                       | 18.7065                   | 18.8941 | 19.1899 | 19.5550 | 19.7258 | 19.7594 | 19.7605 | 19.7618 | 19.7461 | 19.4862 | 19.0312 | 18.6822 | (90) |
| Living area fraction                                                        | fLA = Living area / (4) = |         |         |         |         |         |         |         |         |         |         | 0.7988  | (91) |
| MIT                                                                         | 19.8103                   | 19.9643 | 20.2094 | 20.5239 | 20.7042 | 20.7470 | 20.7503 | 20.7502 | 20.7233 | 20.4535 | 20.0728 | 19.7866 | (92) |
| Temperature adjustment                                                      |                           |         |         |         |         |         |         |         |         |         |         | 0.0000  |      |
| adjusted MIT                                                                | 19.8103                   | 19.9643 | 20.2094 | 20.5239 | 20.7042 | 20.7470 | 20.7503 | 20.7502 | 20.7233 | 20.4535 | 20.0728 | 19.7866 | (93) |

## 8. Space heating requirement

|                                                                                |           |           |           |           |          |          |          |          |          |          |           |               |              |
|--------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|-----------|---------------|--------------|
| Utilisation                                                                    | Jan       | Feb       | Mar       | Apr       | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov       | Dec           |              |
| Useful gains                                                                   | 0.9994    | 0.9978    | 0.9900    | 0.9403    | 0.7843   | 0.5585   | 0.3972   | 0.4561   | 0.7585   | 0.9767   | 0.9981    | 0.9996        | (94)         |
| Ext temp.                                                                      | 580.7054  | 684.7953  | 789.8055  | 883.9806  | 812.6663 | 578.7755 | 392.9272 | 410.8978 | 601.9909 | 645.6066 | 577.1908  | 553.6810      | (95)         |
| Heat loss rate W                                                               | 4.3000    | 4.9000    | 6.5000    | 8.9000    | 11.7000  | 14.6000  | 16.6000  | 16.4000  | 14.1000  | 10.6000  | 7.1000    | 4.2000        | (96)         |
| Space heating kWh                                                              | 1499.6532 | 1453.9606 | 1320.9031 | 1110.8395 | 859.1666 | 582.3345 | 393.1776 | 411.5587 | 629.1963 | 940.2046 | 1241.6949 | 1496.7191     | (97)         |
| Space heating requirement - total per year (kWh/year)                          | 683.6971  | 516.8791  | 395.1367  | 163.3384  | 34.5962  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 219.1809 | 478.4430  | 701.6203      | (98a)        |
| Solar heating kWh                                                              | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000        | (98b)        |
| Space heating contribution - total per year (kWh/year)                         | 683.6971  | 516.8791  | 395.1367  | 163.3384  | 34.5962  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 219.1809 | 478.4430  | 701.6203      | (98c)        |
| Space heating requirement after solar contribution - total per year (kWh/year) |           |           |           |           |          |          |          |          |          |          |           | 3192.8916     |              |
| Space heating per m2                                                           |           |           |           |           |          |          |          |          |          |          |           | (98c) / (4) = | 47.3091 (99) |

## 9a. Energy requirements - Individual heating systems, including micro-CHP

|                                                                       |     |     |     |     |     |     |     |     |     |     |     |               |
|-----------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------|
| -----                                                                 |     |     |     |     |     |     |     |     |     |     |     |               |
| Fraction of space heat from secondary/supplementary system (Table 11) |     |     |     |     |     |     |     |     |     |     |     | 0.0000 (201)  |
| Fraction of space heat from main system(s)                            |     |     |     |     |     |     |     |     |     |     |     | 1.0000 (202)  |
| Efficiency of main space heating system 1 (in %)                      |     |     |     |     |     |     |     |     |     |     |     | 92.3000 (206) |
| Efficiency of main space heating system 2 (in %)                      |     |     |     |     |     |     |     |     |     |     |     | 0.0000 (207)  |
| Efficiency of secondary/supplementary heating system, %               |     |     |     |     |     |     |     |     |     |     |     | 0.0000 (208)  |
|                                                                       | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec           |
| Space heating requirement                                             |     |     |     |     |     |     |     |     |     |     |     |               |

# Full SAP Calculation Printout



|                                                                                                              |          |          |           |           |           |           |           |           |           |           |          |                  |
|--------------------------------------------------------------------------------------------------------------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|------------------|
| Space heating efficiency (main heating system 1)                                                             | 683.6971 | 516.8791 | 395.1367  | 163.3384  | 34.5962   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 219.1809  | 478.4430 | 701.6203 (98)    |
| Space heating fuel (main heating system)                                                                     | 92.3000  | 92.3000  | 92.3000   | 92.3000   | 92.3000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 92.3000   | 92.3000  | 92.3000 (210)    |
| Space heating efficiency (main heating system 2)                                                             | 740.7336 | 559.9990 | 428.1004  | 176.9647  | 37.4823   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 237.4657  | 518.3564 | 760.1520 (211)   |
| Space heating fuel (main heating system 2)                                                                   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (212)     |
| Space heating fuel (secondary)                                                                               | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (213)     |
| Space heating fuel (secondary)                                                                               | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (215)     |
| Water heating requirement                                                                                    | 215.3432 | 190.4467 | 202.5585  | 178.9015  | 173.9118  | 157.2621  | 155.7167  | 161.6622  | 163.1490  | 181.2371  | 191.8284 | 213.1205 (64)    |
| Efficiency of water heater (217)m                                                                            | 86.4642  | 86.1829  | 85.5309   | 83.8562   | 81.1649   | 79.8000   | 79.8000   | 79.8000   | 79.8000   | 84.4872   | 86.0234  | 79.8000 (216)    |
| Fuel for water heating, kWh/month                                                                            | 249.0547 | 220.9796 | 236.8251  | 213.3432  | 214.2697  | 197.0703  | 195.1337  | 202.5842  | 204.4474  | 214.5144  | 222.9957 | 86.5264 (217)    |
| Space cooling fuel requirement (221)m                                                                        | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (221)     |
| Pumps and Fa                                                                                                 | 7.3041   | 6.5973   | 7.3041    | 7.0685    | 7.3041    | 7.0685    | 7.3041    | 7.3041    | 7.0685    | 7.3041    | 7.0685   | 7.3041 (231)     |
| Lighting                                                                                                     | 20.0681  | 16.0994  | 14.4957   | 10.6202   | 8.2033    | 6.7022    | 7.4833    | 9.7271    | 12.6346   | 16.5773   | 18.7240  | 20.6258 (232)    |
| Electricity generated by PVs (Appendix M) (negative quantity) (233a)m                                        | -48.1602 | -64.4556 | -88.0412  | -93.9587  | -97.3350  | -89.5185  | -88.4220  | -85.3616  | -79.4591  | -71.2449  | -51.7144 | -42.0560 (233a)  |
| Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m                              | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (234a)    |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m                  | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (235a)    |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (235c)    |
| Electricity generated by PVs (Appendix M) (negative quantity) (233b)m                                        | -38.7692 | -79.8756 | -155.7552 | -229.7283 | -299.8114 | -299.7903 | -296.2296 | -252.5594 | -187.5031 | -112.7235 | -51.2543 | -30.7838 (233b)  |
| Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m                              | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (234b)    |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m                  | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (235b)    |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (235d)    |
| Annual totals kWh/year                                                                                       |          |          |           |           |           |           |           |           |           |           |          |                  |
| Space heating fuel - main system 1                                                                           |          |          |           |           |           |           |           |           |           |           |          | 3459.2542 (211)  |
| Space heating fuel - main system 2                                                                           |          |          |           |           |           |           |           |           |           |           |          | 0.0000 (213)     |
| Space heating fuel - secondary                                                                               |          |          |           |           |           |           |           |           |           |           |          | 0.0000 (215)     |
| Efficiency of water heater                                                                                   |          |          |           |           |           |           |           |           |           |           |          | 79.8000          |
| Water heating fuel used                                                                                      |          |          |           |           |           |           |           |           |           |           |          | 2617.5247 (219)  |
| Space cooling fuel                                                                                           |          |          |           |           |           |           |           |           |           |           |          | 0.0000 (221)     |
| Electricity for pumps and fans:                                                                              |          |          |           |           |           |           |           |           |           |           |          |                  |
| Total electricity for the above, kWh/year                                                                    |          |          |           |           |           |           |           |           |           |           |          | 86.0000 (231)    |
| Electricity for lighting (calculated in Appendix L)                                                          |          |          |           |           |           |           |           |           |           |           |          | 161.9609 (232)   |
| Energy saving/generation technologies (Appendices M ,N and Q)                                                |          |          |           |           |           |           |           |           |           |           |          |                  |
| PV generation                                                                                                |          |          |           |           |           |           |           |           |           |           |          | -2934.5110 (233) |
| Wind generation                                                                                              |          |          |           |           |           |           |           |           |           |           |          | 0.0000 (234)     |
| Hydro-electric generation (Appendix N)                                                                       |          |          |           |           |           |           |           |           |           |           |          | 0.0000 (235a)    |
| Electricity generated - Micro CHP (Appendix N)                                                               |          |          |           |           |           |           |           |           |           |           |          | 0.0000 (235)     |
| Appendix Q - special features                                                                                |          |          |           |           |           |           |           |           |           |           |          |                  |
| Energy saved or generated                                                                                    |          |          |           |           |           |           |           |           |           |           |          | -0.0000 (236)    |
| Energy used                                                                                                  |          |          |           |           |           |           |           |           |           |           |          | 0.0000 (237)     |
| Total delivered energy for all uses                                                                          |          |          |           |           |           |           |           |           |           |           |          | 3390.2288 (238)  |

## 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

|                                               | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
|-----------------------------------------------|-----------------|----------------------------|-----------------------|
| Space heating - main system 1                 | 3459.2542       | 0.2100                     | 726.4434 (261)        |
| Total CO2 associated with community systems   |                 |                            | 0.0000 (373)          |
| Water heating (other fuel)                    | 2617.5247       | 0.2100                     | 549.6802 (264)        |
| Space and water heating                       |                 |                            | 1276.1236 (265)       |
| Pumps, fans and electric keep-hot             | 86.0000         | 0.1387                     | 11.9293 (267)         |
| Energy for lighting                           | 161.9609        | 0.1443                     | 23.3760 (268)         |
| Energy saving/generation technologies         |                 |                            |                       |
| PV Unit electricity used in dwelling          | -899.7272       | 0.1357                     | -122.0825             |
| PV Unit electricity exported                  | -2034.7838      | 0.1264                     | -257.2829             |
| Total                                         |                 |                            | -379.3654 (269)       |
| Total CO2, kg/year                            |                 |                            | 932.0634 (272)        |
| EPC Target Carbon Dioxide Emission Rate (TER) |                 |                            | 13.8100 (273)         |

## 13a. Primary energy - Individual heating systems including micro-CHP

|                                             | Energy kWh/year | Primary energy factor kg CO2/kWh | Primary energy kWh/year |
|---------------------------------------------|-----------------|----------------------------------|-------------------------|
| Space heating - main system 1               | 3459.2542       | 1.1300                           | 3908.9572 (275)         |
| Total CO2 associated with community systems |                 |                                  | 0.0000 (473)            |
| Water heating (other fuel)                  | 2617.5247       | 1.1300                           | 2957.8029 (278)         |
| Space and water heating                     |                 |                                  | 6866.7602 (279)         |
| Pumps, fans and electric keep-hot           | 86.0000         | 1.5128                           | 130.1008 (281)          |
| Energy for lighting                         | 161.9609        | 1.5338                           | 248.4210 (282)          |
| Energy saving/generation technologies       |                 |                                  |                         |
| PV Unit electricity used in dwelling        | -899.7272       | 1.5015                           | -1350.9775              |
| PV Unit electricity exported                | -2034.7838      | 0.4642                           | -944.4555               |
| Total                                       |                 |                                  | -2295.4330 (283)        |
| Total Primary energy kWh/year               |                 |                                  | 4949.8490 (286)         |
| Target Primary Energy Rate (TPER)           |                 |                                  | 73.3400 (287)           |