

# Full SAP Calculation Printout



|                                    |                                                               |               |         |                |            |
|------------------------------------|---------------------------------------------------------------|---------------|---------|----------------|------------|
| Plot Reference                     | UNIT 03                                                       |               |         | Issued on Date | 08/07/2026 |
| Assessment Reference               | 001                                                           | Plot Type Ref | UNIT 03 |                |            |
| Plot Address                       | UNIT 03, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS |               |         | SAP Version    | 10.2       |
|                                    |                                                               |               |         |                |            |
| SAP Rating                         | 81 B                                                          | DER           | 3.87    | TER            | 16.24      |
| Environmental                      | 97 A                                                          | % DER < TER   |         |                | 76.17      |
| CO <sub>2</sub> Emissions (t/year) | 0.26                                                          | DFEE          | 37.13   | TFEE           | 43.40      |
| Compliance Check                   | See BREL                                                      | % DFEE < TFEE |         |                | 14.43      |
| % DPER < TPER                      | 53.01                                                         | DPER          | 41.23   | TPER           | 87.74      |
|                                    |                                                               |               |         |                |            |
| Assessor Details                   | Mr. Ondrej Gajdos                                             |               |         | Assessor ID    | W452-0001  |
| Client                             |                                                               |               |         |                |            |

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                                          |                           |                                 |                             |
| Basement floor                                         | 39.1000 (1a)              | x 2.9000 (2a)                   | = 113.3900 (1a) - (3a)      |
| Ground floor                                           | 32.6000 (1b)              | x 2.8000 (2b)                   | = 91.2800 (1b) - (3b)       |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 71.7000                   |                                 | (4)                         |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 204.6700 (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                                                                          | 3 (19)                                  |
| Shelter factor                                                                                     | (20) = 1 - [0.075 x (19)] = 0.7750 (20) |
| Infiltration rate adjusted to include shelter factor                                               | (21) = (18) x (20) = 0.1162 (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                                                                                         | 0.1482 | 0.1453 | 0.1424 | 0.1279 | 0.1250 | 0.1104 | 0.1104 | 0.1075 | 0.1162 | 0.1250 | 0.1308 | 0.1366 (22b)  |
| Balanced mechanical ventilation with heat recovery                                                      |        |        |        |        |        |        |        |        |        |        |        |               |
| 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) =            |        |        |        |        |        |        |        |        |        |        |        | 81.0000 (23c) |
| Effective ac                                                                                            | 0.2432 | 0.2403 | 0.2374 | 0.2229 | 0.2200 | 0.2054 | 0.2054 | 0.2025 | 0.2112 | 0.2200 | 0.2258 | 0.2316 (25)   |

## 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                                               |                         |                            |                           |                               |                      |                                |                 |
| dl                                                          |                         |                            | 1.8900                    | 1.0000                        | 1.8900               |                                | (26)            |
| 1                                                           |                         |                            | 30.1500                   | 0.7940                        | 23.9378              |                                | (27)            |
| basement floor                                              |                         |                            | 39.1000                   | 0.1000                        | 3.9100               | 110.0000                       | 4300.9998 (28)  |
| exposed wall                                                | 85.1500                 | 32.0400                    | 53.1100                   | 0.1500                        | 7.9665               | 60.0000                        | 3186.6001 (29a) |
| basement wall                                               | 48.1400                 |                            | 48.1400                   | 0.1500                        | 7.2210               | 9.0000                         | 433.2600 (29a)  |
| Total net area of external elements Aum(A, m <sup>2</sup> ) |                         |                            | 172.3900                  |                               |                      |                                | (31)            |
| Fabric heat loss, W/K = Sum (A x U)                         |                         |                            |                           |                               | (26)...(30) + (32) = | 44.9253                        | (33)            |
| Main dwelling                                               |                         |                            |                           |                               |                      |                                |                 |
| pw                                                          |                         |                            | 35.1700                   | 0.0000                        | 0.0000               | 110.0000                       | 3868.6998 (32)  |
| pc                                                          |                         |                            | 35.9000                   |                               |                      | 30.0000                        | 1077.0000 (32b) |
| iw                                                          |                         |                            | 89.9600                   |                               |                      | 9.0000                         | 809.6400 (32c)  |
| if                                                          |                         |                            | 32.6000                   |                               |                      | 18.0000                        | 586.8000 (32d)  |
| ic                                                          |                         |                            | 32.6000                   |                               |                      | 9.0000                         | 293.4000 (32e)  |

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Heat capacity Cm = Sum(A x k)  
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K  
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 14556.3997 (34)  
203.0181 (35)

|                                                                  | Length  | Psi-value             | Total        |
|------------------------------------------------------------------|---------|-----------------------|--------------|
| K1 Element                                                       | 12.3500 | 0.0500                | 0.6175       |
| E2 Other lintels (including other steel lintels)                 | 11.4500 | 0.0500                | 0.5725       |
| E3 Sill                                                          | 35.2000 | 0.0500                | 1.7600       |
| E4 Jamb                                                          | 8.7000  | 0.1600                | 1.3920       |
| E5 Ground floor (normal)                                         | 16.6000 | 0.0700                | 1.1620       |
| E22 Basement floor                                               | 6.1000  | 0.0000                | 0.0000       |
| E6 Intermediate floor within a dwelling                          | 22.8000 | 0.0700                | 1.5960       |
| E7 Party floor between dwellings (in blocks of flats)            | 8.6000  | 0.0900                | 0.7740       |
| E16 Corner (normal)                                              | 5.7000  | -0.0900               | -0.5130      |
| E17 Corner (inverted - internal area greater than external area) | 14.2000 | 0.0600                | 0.8520       |
| E18 Party wall between dwellings                                 | 5.7000  | 0.0600                | 0.3420       |
| E25 Staggered party wall between dwellings                       |         |                       |              |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)       |         |                       | 8.5550 (36)  |
| Point Thermal bridges                                            |         |                       | 0.0000       |
| Total fabric heat loss                                           |         | (33) + (36) + (36a) = | 53.4803 (37) |

|                                                                     |         |         |         |         |         |         |         |         |         |         |         |         |      |
|---------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| 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                                                               | 16.4273 | 16.2310 | 16.0347 | 15.0532 | 14.8569 | 13.8755 | 13.8755 | 13.6792 | 14.2681 | 14.8569 | 15.2495 | 15.6421 | (38) |
| Heat transfer coeff                                                 | 69.9076 | 69.7113 | 69.5150 | 68.5336 | 68.3373 | 67.3558 | 67.3558 | 67.1595 | 67.7484 | 68.3373 | 68.7299 | 69.1224 | (39) |
| Average = Sum(39)m / 12 =                                           |         |         |         |         |         |         |         |         |         |         |         | 68.4845 |      |
| HLP                                                                 | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |      |
| HLP (average)                                                       | 0.9750  | 0.9723  | 0.9695  | 0.9558  | 0.9531  | 0.9394  | 0.9394  | 0.9367  | 0.9449  | 0.9531  | 0.9586  | 0.9641  | (40) |
| Days in mont                                                        | 31      | 28      | 31      | 30      | 31      | 30      | 31      | 31      | 30      | 31      | 30      | 31      |      |

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

|                                                                                |          |          |          |          |          |          |          |          |          |          |          |           |             |
|--------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------------|
| Assumed occupancy                                                              |          |          |          |          |          |          |          |          |          |          |          |           | 2.2867 (42) |
| Hot water usage for mixer showers                                              | 62.5597  | 61.6196  | 60.2496  | 57.6284  | 55.6940  | 53.5368  | 52.3106  | 53.6702  | 55.1606  | 57.4768  | 60.1543  | 62.3201   | (42a)       |
| Hot water usage for baths                                                      | 27.0260  | 26.6246  | 26.0594  | 25.0172  | 24.2369  | 23.3716  | 22.9042  | 23.4654  | 24.0766  | 25.0024  | 26.0661  | 26.9346   | (42b)       |
| Hot water usage for other uses                                                 | 38.0479  | 36.6643  | 35.2808  | 33.8972  | 32.5136  | 31.1301  | 31.1301  | 32.5136  | 33.8972  | 35.2808  | 36.6643  | 38.0479   | (42c)       |
| Average daily hot water use (litres/day)                                       |          |          |          |          |          |          |          |          |          |          |          | 117.3243  | (43)        |
| Daily hot water use                                                            | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec       |             |
| Energy conte                                                                   | 127.6336 | 124.9085 | 121.5897 | 116.5428 | 112.4445 | 108.0384 | 106.3449 | 109.6493 | 113.1344 | 117.7600 | 122.8847 | 127.3025  | (44)        |
| Energy content (annual)                                                        | 202.1404 | 177.8681 | 186.8789 | 159.5413 | 151.3719 | 132.8459 | 128.6149 | 135.7688 | 139.5060 | 159.7992 | 175.0718 | 199.3250  | (45)        |
| Distribution loss (46)m = 0.15 x (45)m                                         | 30.3211  | 26.6802  | 28.0318  | 23.9312  | 22.7058  | 19.9269  | 19.2922  | 20.3653  | 20.9259  | 23.9699  | 26.2608  | 29.8988   | (46)        |
| Water storage loss (or HIU loss):                                              |          |          |          |          |          |          |          |          |          |          |          |           |             |
| Store volume                                                                   |          |          |          |          |          |          |          |          |          |          |          | 110.0000  | (47)        |
| b) If manufacturer declared loss factor is not known :                         |          |          |          |          |          |          |          |          |          |          |          |           |             |
| Hot water storage loss factor from Table 2 (kWh/litre/day)                     |          |          |          |          |          |          |          |          |          |          |          | 0.0152    | (51)        |
| Volume factor from Table 2a                                                    |          |          |          |          |          |          |          |          |          |          |          | 1.0294    | (52)        |
| Temperature factor from Table 2b                                               |          |          |          |          |          |          |          |          |          |          |          | 0.6000    | (53)        |
| Enter (49) or (54) in (55)                                                     |          |          |          |          |          |          |          |          |          |          |          | 1.0327    | (55)        |
| Total storage loss                                                             | 32.0144  | 28.9162  | 32.0144  | 30.9817  | 32.0144  | 30.9817  | 32.0144  | 32.0144  | 30.9817  | 32.0144  | 30.9817  | 32.0144   | (56)        |
| If cylinder contains dedicated solar storage                                   | 32.0144  | 28.9162  | 32.0144  | 30.9817  | 32.0144  | 30.9817  | 32.0144  | 32.0144  | 30.9817  | 32.0144  | 30.9817  | 32.0144   | (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                | 257.4172 | 227.7955 | 242.1557 | 213.0350 | 206.6487 | 186.3395 | 183.8917 | 191.0456 | 192.9997 | 215.0761 | 228.5655 | 254.6018  | (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                                                                | 257.4172 | 227.7955 | 242.1557 | 213.0350 | 206.6487 | 186.3395 | 183.8917 | 191.0456 | 192.9997 | 215.0761 | 228.5655 | 254.6018  | (64)        |
| 12Total per year (kWh/year)                                                    |          |          |          |          |          |          |          |          |          |          |          | 2599.5719 | (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)       |
| Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = |          |          |          |          |          |          |          |          |          |          |          | 0.0000    | (64a)       |
| Heat gains from water heating, kWh/month                                       | 111.4331 | 99.0831  | 106.3587 | 95.8424  | 94.5526  | 86.9662  | 86.9859  | 89.3646  | 89.1807  | 97.3547  | 101.0063 | 110.4970  | (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                                                                               | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 101.4983 | 112.3731 | 101.4983 | 104.8816 | 101.4983 | 104.8816 | 101.4983 | 101.4983 | 104.8816 | 101.4983 | 104.8816 | 101.4983 | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 201.2318 | 203.3199 | 198.0578 | 186.8555 | 172.7145 | 159.4240 | 150.5451 | 148.4570 | 153.7190 | 164.9214 | 179.0624 | 192.3529 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | (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)                                 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | (71) |
| Water heating gains (Table 5)                                                       | 149.7757 | 147.4451 | 142.9552 | 133.1145 | 127.0868 | 120.7864 | 116.9165 | 120.1136 | 123.8621 | 130.8531 | 140.2866 | 148.5175 | (72) |
| Total internal gains                                                                | 509.8060 | 520.4383 | 499.8115 | 482.1517 | 458.5998 | 442.3922 | 426.2602 | 427.3691 | 439.7629 | 454.5730 | 481.5307 | 499.6689 | (73) |

## 6. Solar gains

| [Jan] | Area<br>m2 | Solar flux<br>Table 6a | g<br>Specific data | FF<br>Specific data | Access<br>factor | Gains<br>W |
|-------|------------|------------------------|--------------------|---------------------|------------------|------------|
|-------|------------|------------------------|--------------------|---------------------|------------------|------------|

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|                                                                                         |               |           |           |           | W/m2      | or Table 6b |           | or Table 6c |                     | Table 6d |          |           |                 |
|-----------------------------------------------------------------------------------------|---------------|-----------|-----------|-----------|-----------|-------------|-----------|-------------|---------------------|----------|----------|-----------|-----------------|
| Southwest                                                                               |               |           |           |           | 20.9600   | 36.7938     |           | 0.5300      |                     | 0.7700   |          | 198.2775  | (79)            |
| Northwest                                                                               |               |           |           |           | 9.1900    | 11.2829     |           | 0.5300      |                     | 0.7700   |          | 26.6591   | (81)            |
|                                                                                         |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| Solar gains                                                                             | 224.9366      | 392.0052  | 559.8793  | 733.1418  | 857.1645  | 866.7943    | 829.0952  | 734.1488    | 619.5008            | 439.5911 | 271.0347 | 191.4554  | (83)            |
| Total gains                                                                             | 734.7425      | 912.4435  | 1059.6909 | 1215.2935 | 1315.7643 | 1309.1865   | 1255.3553 | 1161.5179   | 1059.2637           | 894.1641 | 752.5655 | 691.1242  | (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                                                                                     | 57.8398       | 58.0027   | 58.1665   | 58.9995   | 59.1689   | 60.0311     | 60.0311   | 60.2066     | 59.6832             | 59.1689  | 58.8310  | 58.4968   |                 |
| alpha                                                                                   | 4.8560        | 4.8668    | 4.8778    | 4.9333    | 4.9446    | 5.0021      | 5.0021    | 5.0138      | 4.9789              | 4.9446   | 4.9221   | 4.8998    |                 |
| util living area                                                                        | 0.9581        | 0.9029    | 0.8085    | 0.6457    | 0.4761    | 0.3284      | 0.2359    | 0.2657      | 0.4371              | 0.7245   | 0.9133   | 0.9666    | (86)            |
| MIT                                                                                     | 20.1545       | 20.4551   | 20.7237   | 20.9183   | 20.9833   | 20.9979     | 20.9997   | 20.9995     | 20.9918             | 20.8847  | 20.5093  | 20.0981   | (87)            |
| Th 2                                                                                    | 20.1042       | 20.1065   | 20.1088   | 20.1203   | 20.1226   | 20.1341     | 20.1341   | 20.1364     | 20.1295             | 20.1226  | 20.1180  | 20.1134   | (88)            |
| util rest of house                                                                      | 0.9491        | 0.8853    | 0.7796    | 0.6067    | 0.4333    | 0.2843      | 0.1896    | 0.2160      | 0.3836              | 0.6793   | 0.8942   | 0.9592    | (89)            |
| MIT 2                                                                                   | 19.1504       | 19.5156   | 19.8279   | 20.0460   | 20.1097   | 20.1330     | 20.1340   | 20.1362     | 20.1244             | 20.0206  | 19.5970  | 19.0879   | (90)            |
| Living area fraction                                                                    |               |           |           |           |           |             |           |             | fLA = Living area / | (4) =    |          | 0.4086    | (91)            |
| MIT                                                                                     | 19.5607       | 19.8995   | 20.1940   | 20.4024   | 20.4667   | 20.4864     | 20.4878   | 20.4890     | 20.4788             | 20.3737  | 19.9698  | 19.5007   | (92)            |
| Temperature adjustment                                                                  |               |           |           |           |           |             |           |             |                     |          |          | 0.0000    |                 |
| adjusted MIT                                                                            | 19.5607       | 19.8995   | 20.1940   | 20.4024   | 20.4667   | 20.4864     | 20.4878   | 20.4890     | 20.4788             | 20.3737  | 19.9698  | 19.5007   | (93)            |
|                                                                                         |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| 8. Space heating requirement                                                            |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
|                                                                                         |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
|                                                                                         | Jan           | Feb       | Mar       | Apr       | May       | Jun         | Jul       | Aug         | Sep                 | Oct      | Nov      | Dec       |                 |
| Utilisation                                                                             | 0.9426        | 0.8808    | 0.7825    | 0.6195    | 0.4502    | 0.3023      | 0.2085    | 0.2363      | 0.4052              | 0.6927   | 0.8906   | 0.9531    | (94)            |
| Useful gains                                                                            | 692.6032      | 803.6415  | 829.2328  | 752.8488  | 592.3601  | 395.7823    | 261.7826  | 274.4621    | 429.1938            | 619.4045 | 670.2653 | 658.7090  | (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                                                                        | 1066.8390     | 1045.6369 | 951.9360  | 788.3034  | 599.0931  | 396.4853    | 261.8642  | 274.6140    | 432.1547            | 667.9072 | 884.5400 | 1057.6219 | (97)            |
| Space heating kWh                                                                       | 278.4314      | 162.6209  | 91.2912   | 25.5273   | 5.0094    | 0.0000      | 0.0000    | 0.0000      | 0.0000              | 36.0860  | 154.2778 | 296.7912  | (98a)           |
| Space heating requirement - total per year (kWh/year)                                   |               |           |           |           |           |             |           |             |                     |          |          |           | 1050.0351       |
| 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                                                                       | 278.4314      | 162.6209  | 91.2912   | 25.5273   | 5.0094    | 0.0000      | 0.0000    | 0.0000      | 0.0000              | 36.0860  | 154.2778 | 296.7912  | (98c)           |
| Space heating requirement after solar contribution - total per year (kWh/year)          |               |           |           |           |           |             |           |             |                     |          |          |           | 1050.0351       |
| Space heating per m2                                                                    | (98c) / (4) = |           |           |           |           |             |           |             |                     |          |          |           | 14.6448 (99)    |
|                                                                                         |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| 9b. Energy requirements                                                                 |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
|                                                                                         |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| Fraction of space heat from secondary/supplementary system (Table 11)                   |               |           |           |           |           |             |           |             |                     |          |          |           | 0.0000 (301)    |
| Fraction of space heat from community system                                            |               |           |           |           |           |             |           |             |                     |          |          |           | 1.0000 (302)    |
| Fraction of heat from community Heat pump-Space and Water                               |               |           |           |           |           |             |           |             |                     |          |          |           | 1.0000 (303a)   |
| Factor for control and charging method (Table 4c(3)) for space heating                  |               |           |           |           |           |             |           |             |                     |          |          |           | 1.0000 (305)    |
| Factor for charging method (Table 4c(3)) for water heating                              |               |           |           |           |           |             |           |             |                     |          |          |           | 1.0000 (305a)   |
| Distribution loss factor (Table 12c) for community heating system                       |               |           |           |           |           |             |           |             |                     |          |          |           | 1.5000 (306)    |
| Efficiency of secondary/supplementary heating system, %                                 |               |           |           |           |           |             |           |             |                     |          |          |           | 0.0000 (208)    |
| Space heating:                                                                          |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| Space heating requirement                                                               |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50                                   |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| 307a                                                                                    | 417.6471      | 243.9313  | 136.9368  | 38.2909   | 7.5140    | 0.0000      | 0.0000    | 0.0000      | 0.0000              | 54.1290  | 231.4167 | 445.1868  |                 |
| Space heating requirement                                                               |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
|                                                                                         | 417.6471      | 243.9313  | 136.9368  | 38.2909   | 7.5140    | 0.0000      | 0.0000    | 0.0000      | 0.0000              | 54.1290  | 231.4167 | 445.1868  | (307)           |
| Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) |               |           |           |           |           |             |           |             |                     |          |          |           | 0.0000 (308)    |
| Space heating fuel for secondary/supplementary system                                   |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
|                                                                                         | 0.0000        | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000      | 0.0000    | 0.0000      | 0.0000              | 0.0000   | 0.0000   | 0.0000    | (309)           |
| Water heating                                                                           |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| Annual water heating requirement                                                        |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
|                                                                                         | 257.4172      | 227.7955  | 242.1557  | 213.0350  | 206.6487  | 186.3395    | 183.8917  | 191.0456    | 192.9997            | 215.0761 | 228.5655 | 254.6018  | (64)            |
| Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50                                   |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| 310a                                                                                    | 386.1258      | 341.6932  | 363.2336  | 319.5524  | 309.9731  | 279.5093    | 275.8376  | 286.5683    | 289.4995            | 322.6141 | 342.8483 | 381.9027  |                 |
| Water heating fuel                                                                      |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
|                                                                                         | 386.1258      | 341.6932  | 363.2336  | 319.5524  | 309.9731  | 279.5093    | 275.8376  | 286.5683    | 289.4995            | 322.6141 | 342.8483 | 381.9027  | (310)           |
| Cooling System Energy Efficiency Ratio                                                  |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| Space coolin                                                                            | 0.0000        | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000      | 0.0000    | 0.0000      | 0.0000              | 0.0000   | 0.0000   | 0.0000    | (314)           |
| Pumps and Fa                                                                            | 14.6966       | 13.2743   | 14.6966   | 14.2225   | 14.6966   | 14.2225     | 14.6966   | 14.6966     | 14.2225             | 14.6966  | 14.2225  | 14.6966   | (331)           |
| Lighting                                                                                | 21.0893       | 16.9187   | 15.2334   | 11.1606   | 8.6208    | 7.0433      | 7.8642    | 10.2221     | 13.2776             | 17.4209  | 19.6768  | 21.6755   | (332)           |
| Electricity generated by PVs (Appendix M) (negative quantity)                           |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| (333a)m                                                                                 | -3.0541       | -5.4543   | -10.1336  | -14.3736  | -18.0786  | -17.8717    | -17.4912  | -14.9935    | -11.2003            | -7.1395  | -3.6761  | -2.4904   | (333a)          |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                 |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| (334a)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    | (334a)          |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)     |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| (335a)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    | (335a)          |
| Electricity generated by PVs (Appendix M) (negative quantity)                           |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| (333b)m                                                                                 | -0.3504       | -0.9324   | -2.4370   | -4.6344   | -7.0627   | -7.4723     | -7.2572   | -5.5647     | -3.3725             | -1.5028  | -0.5057  | -0.2594   | (333b)          |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                 |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| (334b)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    | (334b)          |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)     |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| (335b)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    | (335b)          |
| Annual totals kWh/year                                                                  |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| Space heating fuel - community heating                                                  |               |           |           |           |           |             |           |             |                     |          |          |           | 1575.0527 (307) |
| Space heating fuel - secondary                                                          |               |           |           |           |           |             |           |             |                     |          |          |           | 0.0000 (309)    |
| Water heating fuel - community heating                                                  |               |           |           |           |           |             |           |             |                     |          |          |           | 3899.3579 (310) |
| Efficiency of water heater                                                              |               |           |           |           |           |             |           |             |                     |          |          |           | 0.0000 (311)    |
| Electricity used for heat distribution                                                  |               |           |           |           |           |             |           |             |                     |          |          |           | 15.7505 (313)   |
| Space cooling fuel                                                                      |               |           |           |           |           |             |           |             |                     |          |          |           | 0.0000 (321)    |
| Electricity for pumps and fans:                                                         |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)              |               |           |           |           |           |             |           |             |                     |          |          |           |                 |
| mechanical ventilation fans (SFP = 0.6930)                                              |               |           |           |           |           |             |           |             |                     |          |          |           | 173.0403 (330a) |

# Full SAP Calculation Printout



|                                                               |                 |
|---------------------------------------------------------------|-----------------|
| Total electricity for the above, kWh/year                     | 173.0403 (331)  |
| Electricity for lighting (calculated in Appendix L)           | 170.2031 (332)  |
| Energy saving/generation technologies (Appendices M ,N and Q) |                 |
| PV generation                                                 | -167.3084 (333) |
| Wind generation                                               | 0.0000 (334)    |
| Hydro-electric generation (Appendix N)                        | 0.0000 (335a)   |
| Electricity generated - Micro CHP (Appendix N)                | 0.0000 (335)    |
| Appendix Q - special features                                 |                 |
| Energy saved or generated                                     | -0.0000 (336)   |
| Energy used                                                   | 0.0000 (337)    |
| Total delivered energy for all uses                           | 5650.3456 (338) |

## 12b. Carbon dioxide emissions - Community heating scheme

|                                                         | Energy<br>kWh/year | Emission factor<br>kg CO2/kWh | Emissions<br>kg CO2/year |
|---------------------------------------------------------|--------------------|-------------------------------|--------------------------|
| Efficiency of heat source Heat pump                     |                    |                               | 330.0000 (367)           |
| Space and Water heating from Heat pump                  | 1658.9123          | 0.1583                        | 75.5743 (367)            |
| Electrical energy for heat distribution (space & water) | 15.7505            | 0.0000                        | 7.9866 (372)             |
| Overall CO2 factor for heat network                     |                    |                               | 0.0457 (386)             |
| Total CO2 associated with community systems             |                    |                               | 250.0052 (373)           |
| Space and water heating                                 |                    |                               | 250.0052 (376)           |
| Pumps, fans and electric keep-hot                       | 173.0403           | 0.1387                        | 24.0028 (378)            |
| Energy for lighting                                     | 170.2031           | 0.1443                        | 24.5656 (379)            |
| Energy saving/generation technologies                   |                    |                               |                          |
| PV Unit electricity used in dwelling                    | -125.9568          | 0.1304                        | -16.4266                 |
| PV Unit electricity exported                            | -41.3516           | 0.1205                        | -4.9846                  |
| Total                                                   |                    |                               | -21.4112 (380)           |
| Total CO2, kg/year                                      |                    |                               | 277.1623 (383)           |
| EPC Dwelling Carbon Dioxide Emission Rate (DER)         |                    |                               | 3.8700 (384)             |

## 13b. Primary energy - Community heating scheme

|                                                         | Energy<br>kWh/year | Primary energy factor<br>kg CO2/kWh | Primary energy<br>kWh/year |
|---------------------------------------------------------|--------------------|-------------------------------------|----------------------------|
| Efficiency of heat source Heat pump                     |                    |                                     | 330.0000 (467a)            |
| Space and Water heating from Heat pump                  | 1658.9123          | 1.5861                              | 757.0198 (467)             |
| Electrical energy for heat distribution (space & water) | 15.7505            | 0.0000                              | 84.2850 (472)              |
| Overall CO2 factor for heat network                     |                    |                                     | 0.4819 (486)               |
| Total CO2 associated with community systems             |                    |                                     | 2638.3767 (473)            |
| Space and water heating                                 |                    |                                     | 2638.3767 (476)            |
| Pumps, fans and electric keep-hot                       | 173.0403           | 1.5128                              | 261.7754 (478)             |
| Energy for lighting                                     | 170.2031           | 1.5338                              | 261.0632 (479)             |
| Energy saving/generation technologies                   |                    |                                     |                            |
| PV Unit electricity used in dwelling                    | -125.9568          | 1.4817                              | -186.6358                  |
| PV Unit electricity exported                            | -41.3516           | 0.4422                              | -18.2854                   |
| Total                                                   |                    |                                     | -204.9212 (480)            |
| Total Primary energy kWh/year                           |                    |                                     | 2956.2940 (483)            |
| Dwelling Primary energy Rate (DPER)                     |                    |                                     | 41.2300 (484)              |

## 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                                          |              |                                 |                        |
| Basement floor                                         | 39.1000 (1a) | x 2.9000 (2a)                   | = 113.3900 (1a) - (3a) |
| Ground floor                                           | 32.6000 (1b) | x 2.8000 (2b)                   | = 91.2800 (1b) - (3b)  |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 71.7000      |                                 | (4)                    |
| Dwelling volume                                        |              | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 204.6700 (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                                                              | 3 * 10 = 30.0000 (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) | 30.0000 / (5) = 0.1466 (8)              |
| Pressure test                                                                                    | Yes                                     |
| Pressure Test Method                                                                             | Blower Door                             |
| Measured/design AP50                                                                             | 5.0000 (17)                             |
| Infiltration rate                                                                                | 0.3966 (18)                             |
| Number of sides sheltered                                                                        | 3 (19)                                  |
| Shelter factor                                                                                   | (20) = 1 - [0.075 x (19)] = 0.7750 (20) |
| Infiltration rate adjusted to include shelter factor                                             | (21) = (18) x (20) = 0.3073 (21)        |

# Full SAP Calculation Printout



|                 |        |        |        |        |        |        |        |        |        |        |        |              |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------------|
| 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 (22)  |
| 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 (22a) |
| Effective ac    | 0.3919 | 0.3842 | 0.3765 | 0.3381 | 0.3304 | 0.2920 | 0.2920 | 0.2843 | 0.3073 | 0.3304 | 0.3458 | 0.3611 (22b) |
|                 | 0.5768 | 0.5738 | 0.5709 | 0.5571 | 0.5546 | 0.5426 | 0.5426 | 0.5404 | 0.5472 | 0.5546 | 0.5598 | 0.5652 (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                                   |             |                | 1.8900        | 1.0000               | 1.8900       |                   | (26)          |
| TER Opening Type                                  |             |                | 16.0300       | 1.1450               | 18.3550      |                   | (27)          |
| basement floor                                    |             |                | 39.1000       | 0.1300               | 5.0830       |                   | (28)          |
| exposed wall                                      | 85.1500     | 17.9200        | 67.2300       | 0.1800               | 12.1014      |                   | (29a)         |
| basement wall                                     | 48.1400     |                | 48.1400       | 0.1800               | 8.6652       |                   | (29a)         |
| Total net area of external elements Aum(A, m2)    |             |                | 172.3900      |                      |              |                   | (31)          |
| Fabric heat loss, W/K = Sum (A x U)               |             |                |               | (26)...(30) + (32) = | 46.0946      |                   | (33)          |
| Main dwelling                                     |             |                |               |                      |              |                   |               |
| pw                                                |             |                | 35.1700       | 0.0000               | 0.0000       |                   | (32)          |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K |             |                |               |                      |              |                   | 203.0181 (35) |

## List of Thermal Bridges

| K1 Element                                                       | Length  | Psi-value             | Total        |
|------------------------------------------------------------------|---------|-----------------------|--------------|
| E2 Other lintels (including other steel lintels)                 | 12.3500 | 0.0500                | 0.6175       |
| E3 Sill                                                          | 11.4500 | 0.0500                | 0.5725       |
| E4 Jamb                                                          | 35.2000 | 0.0500                | 1.7600       |
| E5 Ground floor (normal)                                         | 8.7000  | 0.1600                | 1.3920       |
| E22 Basement floor                                               | 16.6000 | 0.0700                | 1.1620       |
| E6 Intermediate floor within a dwelling                          | 6.1000  | 0.0000                | 0.0000       |
| E7 Party floor between dwellings (in blocks of flats)            | 22.8000 | 0.0700                | 1.5960       |
| E16 Corner (normal)                                              | 8.6000  | 0.0900                | 0.7740       |
| E17 Corner (inverted - internal area greater than external area) | 5.7000  | -0.0900               | -0.5130      |
| E18 Party wall between dwellings                                 | 14.2000 | 0.0600                | 0.8520       |
| E25 Staggered party wall between dwellings                       | 5.7000  | 0.0600                | 0.3420       |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)       |         |                       | 8.5550 (36)  |
| Point Thermal bridges                                            |         |                       | 0.0000       |
| Total fabric heat loss                                           |         | (33) + (36) + (36a) = | 54.6496 (37) |

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

|                           |         |         |         |         |         |         |         |         |         |         |         |              |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| (38)m                     | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec          |
| Heat transfer coeff       | 38.9564 | 38.7550 | 38.5576 | 37.6305 | 37.4571 | 36.6496 | 36.6496 | 36.5000 | 36.9606 | 37.4571 | 37.8080 | 38.1748 (38) |
| Average = Sum(39)m / 12 = | 93.6059 | 93.4046 | 93.2072 | 92.2801 | 92.1066 | 91.2991 | 91.2991 | 91.1496 | 91.6102 | 92.1066 | 92.4575 | 92.8244 (39) |
|                           |         |         |         |         |         |         |         |         |         |         |         | 92.2792      |
| HLP                       | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec          |
| HLP (average)             | 1.3055  | 1.3027  | 1.3000  | 1.2870  | 1.2846  | 1.2733  | 1.2733  | 1.2713  | 1.2777  | 1.2846  | 1.2895  | 1.2946 (40)  |
| Days in mont              | 31      | 28      | 31      | 30      | 31      | 30      | 31      | 31      | 30      | 31      | 30      | 31           |

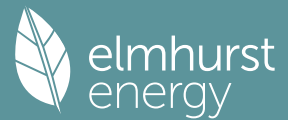
## 4. Water heating energy requirements (kWh/year)

|                                                                 |          |          |          |          |          |          |          |                                        |          |          |          |                |             |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------------------------------------|----------|----------|----------|----------------|-------------|
| Assumed occupancy                                               |          |          |          |          |          |          |          |                                        |          |          |          |                | 2.2867 (42) |
| Hot water usage for mixer showers                               | 62.5597  | 61.6196  | 60.2496  | 57.6284  | 55.6940  | 53.5368  | 52.3106  | 53.6702                                | 55.1606  | 57.4768  | 60.1543  | 62.3201 (42a)  |             |
| Hot water usage for baths                                       | 27.0260  | 26.6246  | 26.0594  | 25.0172  | 24.2369  | 23.3716  | 22.9042  | 23.4654                                | 24.0766  | 25.0024  | 26.0661  | 26.9346 (42b)  |             |
| Hot water usage for other uses                                  | 38.0479  | 36.6643  | 35.2808  | 33.8972  | 32.5136  | 31.1301  | 31.1301  | 32.5136                                | 33.8972  | 35.2808  | 36.6643  | 38.0479 (42c)  |             |
| Average daily hot water use (litres/day)                        |          |          |          |          |          |          |          |                                        |          |          |          | 117.3243 (43)  |             |
| Daily hot water use                                             | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug                                    | Sep      | Oct      | Nov      | Dec            |             |
| Energy content (annual)                                         | 127.6336 | 124.9085 | 121.5897 | 116.5428 | 112.4445 | 108.0384 | 106.3449 | 109.6493                               | 113.1344 | 117.7600 | 122.8847 | 127.3025 (44)  |             |
| Distribution loss (46)m = 0.15 x (45)m                          | 202.1404 | 177.8681 | 186.8789 | 159.5413 | 151.3719 | 132.8459 | 128.6149 | 135.7688                               | 139.5060 | 159.7992 | 175.0718 | 199.3250 (45)  |             |
| Total heat required for water heating calculated for each month | 30.3211  | 26.6802  | 28.0318  | 23.9312  | 22.7058  | 19.9269  | 19.2922  | 20.3653                                | 20.9259  | 23.9699  | 26.2608  | 29.8988 (46)   |             |
| Water storage loss (or HIU loss):                               |          |          |          |          |          |          |          |                                        |          |          |          |                |             |
| Total storage 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 (56)    |             |
| If cylinder contains dedicated solar storage                    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000 (57)    |             |
| Primary 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 (59)    |             |
| Combi loss                                                      | 50.9589  | 46.0274  | 50.9589  | 49.3151  | 50.9589  | 49.3151  | 50.9589  | 50.9589                                | 49.3151  | 50.9589  | 49.3151  | 50.9589 (61)   |             |
| Total heat required for water heating calculated for each month | 253.0993 | 223.8954 | 237.8378 | 208.8563 | 202.3308 | 182.1609 | 179.5738 | 186.7277                               | 188.8211 | 210.7582 | 224.3869 | 250.2839 (62)  |             |
| WWHRS                                                           | -28.5997 | -25.2938 | -26.4862 | -21.9316 | -20.4395 | -17.4902 | -16.3943 | -17.4337                               | -18.0961 | -21.3333 | -24.1680 | -28.0701 (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                                                 | 224.4996 | 198.6016 | 211.3516 | 186.9247 | 181.8913 | 164.6707 | 163.1795 | 169.2940                               | 170.7250 | 189.4249 | 200.2189 | 222.2138 (64)  |             |
| 12Total per year (kWh/year)                                     |          |          |          |          |          |          |          | Total per year (kWh/year) = Sum(64)m = |          |          |          | 2282.9957 (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                        | 79.9514  | 70.6480  | 74.8770  | 65.3762  | 63.0709  | 56.5000  | 55.5042  | 57.8828                                | 58.7145  | 65.8730  | 70.5402  | 79.0153 (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                                                                               | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 | 114.3340 (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 101.4932 | 112.3674 | 101.4932 | 104.8763 | 101.4932 | 104.8763 | 101.4932 | 101.4932 | 104.8763 | 101.4932 | 104.8763 | 101.4932 (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 |          |          |          |          |          |          |          |          |          |          |          |               |

# Full SAP Calculation Printout



|                               |                                                                    |          |          |          |          |          |          |          |          |          |          |               |
|-------------------------------|--------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| Cooking gains                 | 201.2318                                                           | 203.3199 | 198.0578 | 186.8555 | 172.7145 | 159.4240 | 150.5451 | 148.4570 | 153.7190 | 164.9214 | 179.0624 | 192.3529 (68) |
|                               | (calculated in Appendix L, equation L15 or L15a), also see Table 5 |          |          |          |          |          |          |          |          |          |          |               |
| Pumps, fans                   | 34.4334                                                            | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334  | 34.4334 (69)  |
| Losses e.g. evaporation       | 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)   |
| (negative values) (Table 5)   |                                                                    |          |          |          |          |          |          |          |          |          |          |               |
| Water heating gains (Table 5) | -91.4672                                                           | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 | -91.4672 (71) |
| Total internal gains          | 107.4616                                                           | 105.1309 | 100.6411 | 90.8003  | 84.7727  | 78.4722  | 74.6024  | 77.7995  | 81.5479  | 88.5389  | 97.9724  | 106.2033 (72) |
|                               | 470.4867                                                           | 481.1184 | 460.4923 | 442.8323 | 419.2805 | 400.0727 | 383.9409 | 385.0498 | 397.4434 | 415.2537 | 442.2112 | 460.3496 (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    |          |          |               |
|-------------|----------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|---------------|----------|----------|---------------|
| Southwest   |          |          |          | 11.1500    | 36.7938                        | 0.6300                            | 0.7000                             | 0.7700                       | 125.3781 (79) |          |          |               |
| Northwest   |          |          |          | 4.8800     | 11.2829                        | 0.6300                            | 0.7000                             | 0.7700                       | 16.8273 (81)  |          |          |               |
| Solar gains | 142.2054 | 247.8177 | 353.9213 | 463.4103   | 541.7718                       | 547.8449                          | 524.0232                           | 464.0346                     | 391.5979      | 277.8943 | 171.3472 | 121.0395 (83) |
| Total gains | 612.6921 | 728.9362 | 814.4136 | 906.2426   | 961.0523                       | 947.9176                          | 907.9640                           | 849.0844                     | 789.0414      | 693.1480 | 613.5584 | 581.3891 (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                                                                         | 43.1965                   | 43.2896 | 43.3813 | 43.8171 | 43.8996 | 44.2879 | 44.2879 | 44.3605 | 44.1375 | 43.8996 | 43.7330 | 43.5602      |
| alpha                                                                       | 3.8798                    | 3.8860  | 3.8921  | 3.9211  | 3.9266  | 3.9525  | 3.9525  | 3.9574  | 3.9425  | 3.9266  | 3.9155  | 3.9040       |
| util living area                                                            | 0.9838                    | 0.9682  | 0.9396  | 0.8706  | 0.7488  | 0.5780  | 0.4324  | 0.4780  | 0.7013  | 0.9026  | 0.9703  | 0.9866 (86)  |
| MIT                                                                         | 19.3678                   | 19.6430 | 20.0025 | 20.4410 | 20.7663 | 20.9377 | 20.9845 | 20.9770 | 20.8654 | 20.4329 | 19.8238 | 19.3208 (87) |
| Th 2                                                                        | 19.8365                   | 19.8387 | 19.8409 | 19.8510 | 19.8529 | 19.8618 | 19.8618 | 19.8634 | 19.8584 | 19.8529 | 19.8491 | 19.8450 (88) |
| util rest of house                                                          | 0.9795                    | 0.9600  | 0.9239  | 0.8377  | 0.6892  | 0.4892  | 0.3253  | 0.3671  | 0.6161  | 0.8702  | 0.9612  | 0.9830 (89)  |
| MIT 2                                                                       | 17.9738                   | 18.3211 | 18.7689 | 19.3008 | 19.6589 | 19.8251 | 19.8564 | 19.8547 | 19.7675 | 19.3073 | 18.5605 | 17.9201 (90) |
| Living area fraction                                                        | FLA = Living area / (4) = |         |         |         |         |         |         |         |         |         |         |              |
| MIT                                                                         | 18.5434                   | 18.8613 | 19.2730 | 19.7667 | 20.1114 | 20.2797 | 20.3174 | 20.3133 | 20.2162 | 19.7673 | 19.0767 | 18.4925 (92) |
| Temperature adjustment                                                      |                           |         |         |         |         |         |         |         |         |         |         | 0.0000       |
| adjusted MIT                                                                | 18.5434                   | 18.8613 | 19.2730 | 19.7667 | 20.1114 | 20.2797 | 20.3174 | 20.3133 | 20.2162 | 19.7673 | 19.0767 | 18.4925 (93) |

## 8. Space heating requirement

|                                                                                |               |           |           |           |          |          |          |          |          |          |           |                |
|--------------------------------------------------------------------------------|---------------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|-----------|----------------|
|                                                                                | Jan           | Feb       | Mar       | Apr       | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov       | Dec            |
| Utilisation                                                                    | 0.9729        | 0.9511    | 0.9146    | 0.8350    | 0.7036   | 0.5230   | 0.3690   | 0.4121   | 0.6447   | 0.8673   | 0.9533    | 0.9772 (94)    |
| Useful gains                                                                   | 596.1044      | 693.3211  | 744.8590  | 756.7256  | 676.2322 | 495.7591 | 335.0118 | 349.9207 | 508.6735 | 601.1582 | 584.8776  | 568.1190 (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                                                               | 1333.2707     | 1304.0450 | 1190.5386 | 1002.7840 | 774.7465 | 518.5545 | 339.3929 | 356.6978 | 560.3019 | 844.3678 | 1107.3383 | 1326.6928 (97) |
| Space heating kWh                                                              | 548.4517      | 410.4065  | 331.5856  | 177.1620  | 73.2946  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 180.9479 | 376.1717  | 564.3789 (98a) |
| Space heating requirement - total per year (kWh/year)                          |               |           |           |           |          |          |          |          |          |          |           |                |
| 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)                         |               |           |           |           |          |          |          |          |          |          |           |                |
| Space heating kWh                                                              | 548.4517      | 410.4065  | 331.5856  | 177.1620  | 73.2946  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 180.9479 | 376.1717  | 564.3789 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) |               |           |           |           |          |          |          |          |          |          |           | 2662.3988      |
| Space heating per m <sup>2</sup>                                               | (98c) / (4) = |           |           |           |          |          |          |          |          |          |           | 37.1325 (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 %)                      |          |          |          |          |          |          |          |          |          |          |          | 92.4000 (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                                             | 548.4517 | 410.4065 | 331.5856 | 177.1620 | 73.2946  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 180.9479 | 376.1717 | 564.3789 (98)  |
| Space heating efficiency (main heating system 1)                      | 92.4000  | 92.4000  | 92.4000  | 92.4000  | 92.4000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 92.4000  | 92.4000  | 92.4000 (210)  |
| Space heating fuel (main heating system)                              | 593.5625 | 444.1628 | 358.8589 | 191.7338 | 79.3232  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 195.8311 | 407.1122 | 610.7996 (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                                             | 224.4996 | 198.6016 | 211.3516 | 186.9247 | 181.8913 | 164.6707 | 163.1795 | 169.2940 | 170.7250 | 189.4249 | 200.2189 | 222.2138 (64)  |
| Efficiency of water heater                                            |          |          |          |          |          |          |          |          |          |          |          | 80.3000 (216)  |
| (217)m                                                                | 86.2181  | 85.8999  | 85.3420  | 84.2666  | 82.5949  | 80.3000  | 80.3000  | 80.3000  | 80.3000  | 84.2834  | 85.7113  | 86.2893 (217)  |
| Fuel for water heating, kWh/month                                     | 260.3857 | 231.2012 | 247.6524 | 221.8254 | 220.2210 | 205.0694 | 203.2124 | 210.8269 | 212.6090 | 224.7476 | 233.5968 | 257.5220 (219) |
| 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                                                              | 21.0883  | 16.9178  | 15.2326  | 11.1601  | 8.6203   | 7.0429   | 7.8638   | 10.2216  | 13.2769  | 17.4200  | 19.6758  | 21.6744 (232)  |
| Electricity generated by PVs (Appendix M) (negative quantity)         |          |          |          |          |          |          |          |          |          |          |          |                |
| (233a)m                                                               | -9.3307  | -14.3766 | -22.5603 | -27.7679 | -32.1259 | -30.8004 | -30.4271 | -27.6192 | -23.0981 | -17.4396 | -10.6822 | -7.9310 (233a) |

# Full SAP Calculation Printout



|                                                                                                      |         |         |         |          |          |          |          |          |          |         |         |           |        |
|------------------------------------------------------------------------------------------------------|---------|---------|---------|----------|----------|----------|----------|----------|----------|---------|---------|-----------|--------|
| 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                                                                                              | -2.1194 | -4.6341 | -9.5517 | -14.8669 | -20.1848 | -20.4779 | -20.2378 | -16.8905 | -12.0652 | -6.7920 | -2.8805 | -1.6632   | (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                                                                   |         |         |         |          |          |          |          |          |          |         |         | 2881.3840 | (211)  |
| Space heating fuel - main system 2                                                                   |         |         |         |          |          |          |          |          |          |         |         | 0.0000    | (213)  |
| Space heating fuel - secondary                                                                       |         |         |         |          |          |          |          |          |          |         |         | 0.0000    | (215)  |
| Efficiency of water heater                                                                           |         |         |         |          |          |          |          |          |          |         |         | 80.3000   |        |
| Water heating fuel used                                                                              |         |         |         |          |          |          |          |          |          |         |         | 2728.8696 | (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)                                                  |         |         |         |          |          |          |          |          |          |         |         | 170.1944  | (232)  |
| Energy saving/generation technologies (Appendices M ,N and Q)                                        |         |         |         |          |          |          |          |          |          |         |         |           |        |
| PV generation                                                                                        |         |         |         |          |          |          |          |          |          |         |         | -386.5231 | (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                                                                  |         |         |         |          |          |          |          |          |          |         |         | 5479.9250 | (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                 | 2881.3840          | 0.2100                        | 605.0906                 | (261) |
| Total CO2 associated with community systems   |                    |                               | 0.0000                   | (373) |
| Water heating (other fuel)                    | 2728.8696          | 0.2100                        | 573.0626                 | (264) |
| Space and water heating                       |                    |                               | 1178.1533                | (265) |
| Pumps, fans and electric keep-hot             | 86.0000            | 0.1387                        | 11.9293                  | (267) |
| Energy for lighting                           | 170.1944           | 0.1443                        | 24.5643                  | (268) |
| Energy saving/generation technologies         |                    |                               |                          |       |
| PV Unit electricity used in dwelling          | -254.1591          | 0.1328                        | -33.7466                 |       |
| PV Unit electricity exported                  | -132.3640          | 0.1249                        | -16.5282                 |       |
| Total                                         |                    |                               | -50.2748                 | (269) |
| Total CO2, kg/year                            |                    |                               | 1164.3720                | (272) |
| EPC Target Carbon Dioxide Emission Rate (TER) |                    |                               | 16.2400                  | (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               | 2881.3840          | 1.1300                              | 3255.9639                  | (275) |
| Total CO2 associated with community systems |                    |                                     | 0.0000                     | (473) |
| Water heating (other fuel)                  | 2728.8696          | 1.1300                              | 3083.6227                  | (278) |
| Space and water heating                     |                    |                                     | 6339.5866                  | (279) |
| Pumps, fans and electric keep-hot           | 86.0000            | 1.5128                              | 130.1008                   | (281) |
| Energy for lighting                         | 170.1944           | 1.5338                              | 261.0499                   | (282) |
| Energy saving/generation technologies       |                    |                                     |                            |       |
| PV Unit electricity used in dwelling        | -254.1591          | 1.4906                              | -378.8545                  |       |
| PV Unit electricity exported                | -132.3640          | 0.4583                              | -60.6631                   |       |
| Total                                       |                    |                                     | -439.5175                  | (283) |
| Total Primary energy kWh/year               |                    |                                     | 6291.2198                  | (286) |
| Target Primary Energy Rate (TPER)           |                    |                                     | 87.7400                    | (287) |