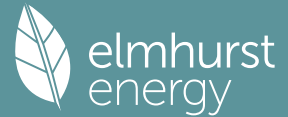


# Full SAP Calculation Printout



|                                    |                                                            |               |       |               |                |            |  |
|------------------------------------|------------------------------------------------------------|---------------|-------|---------------|----------------|------------|--|
| Property Reference                 | UNIT 38                                                    |               |       |               | Issued on Date | 02/07/2025 |  |
| Assessment Reference               | UNIT 38                                                    |               |       | Prop Type Ref |                |            |  |
| Property                           | Flat 39, Alexander House, 205 Kings Road, READING, RG1 4FW |               |       |               |                |            |  |
|                                    |                                                            |               |       |               |                |            |  |
| SAP Rating                         | 87 B                                                       | DER           | 3.44  | TER           | 9.31           |            |  |
| Environmental                      | 97 A                                                       | % DER < TER   |       |               |                | 63.05      |  |
| CO <sub>2</sub> Emissions (t/year) | 0.22                                                       | DFEE          | 33.50 | TFEE          | 38.14          |            |  |
| Compliance Check                   | See BREL                                                   | % DFEE < TFEE |       |               |                | 12.16      |  |
| % DPER < TPER                      | 27.03                                                      | DPER          | 36.30 | TPER          | 49.74          |            |  |
|                                    |                                                            |               |       |               |                |            |  |
| Assessor Details                   | Mr. Ondrej Gajdos                                          |               |       |               | Assessor ID    | W452-0001  |  |
| Client                             |                                                            |               |       |               |                |            |  |

SAP 10 WORKSHEET FOR New Build (As Built) (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                                          | 68.6000 (1b)              | 2.5000 (2b)                     | 171.5000 (1b) - (3b)        |
| Ground floor                                           |                           |                                 |                             |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 68.6000                   |                                 |                             |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 171.5000 (5)                |

## 2. Ventilation rate

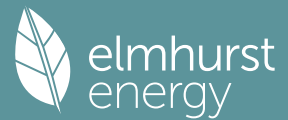
|                                                                                                  | m <sup>3</sup> per hour                 |
|--------------------------------------------------------------------------------------------------|-----------------------------------------|
| Number of open 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                                                                             | 3.5900 (17)                             |
| Infiltration rate                                                                                | 0.1795 (18)                             |
| Number of sides sheltered                                                                        | 2 (19)                                  |
| Shelter factor                                                                                   | (20) = 1 - [0.075 x (19)] = 0.8500 (20) |
| Infiltration rate adjusted to include shelter factor                                             | (21) = (18) x (20) = 0.1526 (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 infiltr rate                                                                                        | 0.1945 | 0.1907 | 0.1869 | 0.1678 | 0.1640 | 0.1449 | 0.1449 | 0.1411 | 0.1526 | 0.1640 | 0.1716 | 0.1793 (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) =            |        |        |        |        |        |        |        |        |        |        |        | 79.2000 (23c) |
| Effective ac                                                                                            | 0.2985 | 0.2947 | 0.2909 | 0.2718 | 0.2680 | 0.2489 | 0.2489 | 0.2451 | 0.2566 | 0.2680 | 0.2756 | 0.2833 (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                                                            |                         |                            |                           |                               |              |                                |                 |
| 1                                                                        |                         |                            | 6.5000                    | 1.1450                        | 7.4427       |                                | (27)            |
| 2                                                                        |                         |                            | 3.3800                    | 1.1450                        | 3.8702       |                                | (27)            |
| 3                                                                        |                         |                            | 6.5000                    | 1.1450                        | 7.4427       |                                | (27)            |
| 1                                                                        |                         |                            | 2.1000                    | 1.0000                        | 2.1000       |                                | (26)            |
| top floor exposed new                                                    | 42.2500                 | 16.3800                    | 25.8700                   | 0.2000                        | 5.1740       | 18.0000                        | 465.6600 (29a)  |
| corridor new                                                             | 18.2500                 | 2.1000                     | 16.1500                   | 0.2300                        | 3.7145       | 14.0000                        | 226.1000 (29a)  |
| flat roof new                                                            | 31.6000                 |                            | 31.6000                   | 0.1300                        | 4.1080       | 9.0000                         | 284.4000 (30)   |
| roof terrace new                                                         | 37.0000                 |                            | 37.0000                   | 0.1300                        | 4.8100       | 9.0000                         | 333.0000 (30)   |
| Total net area of external elements A <sub>um</sub> (A, m <sup>2</sup> ) |                         |                            | 129.1000                  |                               |              |                                | (31)            |
| Fabric heat loss, W/K = Sum (A x U)                                      |                         |                            |                           | (26)...(30) + (32) =          | 38.6622      |                                | (33)            |
| Main dwelling                                                            |                         |                            |                           |                               |              |                                |                 |
| pw                                                                       |                         |                            | 27.2500                   | 0.0000                        | 0.0000       | 20.0000                        | 545.0000 (32)   |
| pf                                                                       |                         |                            | 66.4000                   |                               |              | 30.0000                        | 1992.0000 (32d) |
| iw                                                                       |                         |                            | 87.5000                   |                               |              | 9.0000                         | 787.5000 (32c)  |

# Full SAP Calculation Printout



Heat capacity  $C_m = \text{Sum}(A \times k)$   
 Thermal mass parameter (TMP =  $C_m / \text{TFA}$ ) in  $\text{kJ/m}^2\text{K}$   
 List of Thermal Bridges

|                                                            |         |           |                       |              |
|------------------------------------------------------------|---------|-----------|-----------------------|--------------|
| K1 Element                                                 | Length  | Psi-value | Total                 |              |
| E2 Other lintels (including other steel lintels)           | 7.5500  | 0.0470    | 0.3548                |              |
| E3 Sill                                                    | 6.5500  | 0.0150    | 0.0982                |              |
| E4 Jamb                                                    | 19.2000 | 0.0470    | 0.9024                |              |
| E7 Party floor between dwellings (in blocks of flats)      | 0.0000  | 0.0700    | 0.0000                |              |
| E14 Flat roof                                              | 0.0000  | 0.0800    | 0.0000                |              |
| E15 Flat roof with parapet                                 | 17.0000 | 0.1970    | 3.3490                |              |
| E16 Corner (normal)                                        | 2.5000  | 0.1800    | 0.4500                |              |
| E18 Party wall between dwellings                           | 5.0000  | 0.2400    | 1.2000                |              |
| E24 Eaves (insulation at ceiling level - inverted)         | 17.0000 | 0.0500    | 0.8500                |              |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K) |         |           | 7.2045                | (36)         |
| Point Thermal Bridges                                      |         |           | 0.0000                |              |
| Total fabric heat loss                                     |         |           | (33) + (36) + (36a) = | 45.8667 (37) |

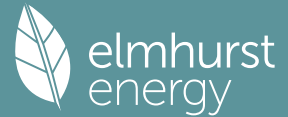
|                                                                                        |         |         |         |         |         |         |         |         |         |         |         |         |      |
|----------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$ | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |      |
| (38)m                                                                                  | 16.8955 | 16.6796 | 16.4637 | 15.3844 | 15.1685 | 14.0891 | 14.0891 | 13.8732 | 14.5209 | 15.1685 | 15.6002 | 16.0320 | (38) |
| Heat transfer coeff                                                                    | 62.7622 | 62.5463 | 62.3305 | 61.2511 | 61.0352 | 59.9558 | 59.9558 | 59.7400 | 60.3876 | 61.0352 | 61.4670 | 61.8987 | (39) |
| Average = $\text{Sum}(39)\text{m} / 12 =$                                              |         |         |         |         |         |         |         |         |         |         |         | 61.1971 |      |
| HLP                                                                                    | 0.9149  | 0.9118  | 0.9086  | 0.8929  | 0.8897  | 0.8740  | 0.8740  | 0.8708  | 0.8803  | 0.8897  | 0.8960  | 0.9023  | (40) |
| HLP (average)                                                                          |         |         |         |         |         |         |         |         |         |         |         | 0.8921  |      |
| Days in mont                                                                           | 31      | 28      | 31      | 30      | 31      | 30      | 31      | 31      | 30      | 31      | 30      | 31      |      |

|                                                                    |          |          |          |          |          |          |          |          |          |                             |            |           |             |
|--------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------------------------|------------|-----------|-------------|
| 4. Water heating energy requirements (kWh/year)                    |          |          |          |          |          |          |          |          |          |                             |            |           |             |
| Assumed occupancy                                                  |          |          |          |          |          |          |          |          |          |                             |            |           | 2.2117 (42) |
| Hot water usage for mixer showers                                  | 61.3019  | 60.3807  | 59.0382  | 56.4697  | 54.5742  | 52.4604  | 51.2589  | 52.5911  | 54.0516  | 56.3212                     | 58.9449    | 61.0671   | (42a)       |
| Hot water usage for baths                                          | 26.4851  | 26.0917  | 25.5378  | 24.5165  | 23.7518  | 22.9038  | 22.4458  | 22.9958  | 23.5947  | 24.5020                     | 25.5444    | 26.3955   | (42b)       |
| Hot water usage for other uses                                     | 37.2796  | 35.9240  | 34.5684  | 33.2128  | 31.8571  | 30.5015  | 30.5015  | 31.8571  | 33.2128  | 34.5684                     | 35.9240    | 37.2796   | (42c)       |
| Average daily hot water use (litres/day)                           |          |          |          |          |          |          |          |          |          |                             |            | 114.9647  | (43)        |
| Daily hot water use                                                | 125.0666 | 122.3964 | 119.1444 | 114.1990 | 110.1831 | 105.8657 | 104.2061 | 107.4441 | 110.8590 | 115.3916                    | 120.4133   | 124.7422  | (44)        |
| Energy conte                                                       | 198.0749 | 174.2908 | 183.1206 | 156.3327 | 148.3277 | 130.1742 | 126.0283 | 133.0382 | 136.7002 | 156.5853                    | 171.5508   | 195.3161  | (45)        |
| Energy content (annual)                                            |          |          |          |          |          |          |          |          |          | Total =                     | Sum(45)m = | 1909.5399 |             |
| Distribution loss (46)m = $0.15 \times (45)\text{m}$               | 29.7112  | 26.1436  | 27.4681  | 23.4499  | 22.2491  | 19.5261  | 18.9042  | 19.9557  | 20.5050  | 23.4878                     | 25.7326    | 29.2974   | (46)        |
| Water storage loss:                                                |          |          |          |          |          |          |          |          |          |                             |            |           |             |
| Store volume                                                       |          |          |          |          |          |          |          |          |          |                             |            | 150.0000  | (47)        |
| a) If manufacturer declared loss factor is known (kWh/day):        |          |          |          |          |          |          |          |          |          |                             |            | 1.5500    | (48)        |
| Temperature factor from Table 2b                                   |          |          |          |          |          |          |          |          |          |                             |            | 0.5400    | (49)        |
| Enter (49) or (54) in (55)                                         |          |          |          |          |          |          |          |          |          |                             |            | 0.8370    | (55)        |
| Total storage loss                                                 | 25.9470  | 23.4360  | 25.9470  | 25.1100  | 25.9470  | 25.1100  | 25.9470  | 25.9470  | 25.1100  | 25.9470                     | 25.1100    | 25.9470   | (56)        |
| If cylinder contains dedicated solar storage                       | 25.9470  | 23.4360  | 25.9470  | 25.1100  | 25.9470  | 25.1100  | 25.9470  | 25.9470  | 25.1100  | 25.9470                     | 25.1100    | 25.9470   | (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    | 247.2843 | 218.7380 | 232.3300 | 203.9547 | 197.5371 | 177.7962 | 175.2377 | 182.2476 | 184.3222 | 205.7947                    | 219.1728   | 244.5255  | (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                                                    | 247.2843 | 218.7380 | 232.3300 | 203.9547 | 197.5371 | 177.7962 | 175.2377 | 182.2476 | 184.3222 | 205.7947                    | 219.1728   | 244.5255  | (64)        |
| 12Total per year (kWh/year)                                        |          |          |          |          |          |          |          |          |          | Total per year (kWh/year) = | Sum(64)m = | 2488.9409 | (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                           | 105.2274 | 93.5095  | 100.2551 | 90.0782  | 88.6865  | 81.3805  | 81.2719  | 83.6027  | 83.5504  | 91.4321                     | 95.1382    | 104.3101  | (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                                                                               | 110.5831 | 110.5831 | 110.5831 | 110.5831 | 110.5831 | 110.5831 | 110.5831 | 110.5831 | 110.5831 | 110.5831 | 110.5831 | 110.5831 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 97.8546  | 108.3390 | 97.8546  | 101.1164 | 97.8546  | 101.1164 | 97.8546  | 97.8546  | 101.1164 | 97.8546  | 101.1164 | 97.8546  | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 194.0077 | 196.0209 | 190.9477 | 180.1475 | 166.5142 | 153.7008 | 145.1407 | 143.1275 | 148.2007 | 159.0009 | 172.6342 | 185.4476 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 34.0583  | 34.0583  | 34.0583  | 34.0583  | 34.0583  | 34.0583  | 34.0583  | 34.0583  | 34.0583  | 34.0583  | 34.0583  | 34.0583  | (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)                                 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | (71) |
| Water heating gains (Table 5)                                                       | 141.4347 | 139.1510 | 134.7515 | 125.1086 | 119.2022 | 113.0285 | 109.2365 | 112.3693 | 116.0423 | 122.8927 | 132.1364 | 140.2018 | (72) |
| Total internal gains                                                                | 489.4720 | 499.6859 | 479.7288 | 462.5475 | 439.7460 | 424.0207 | 408.4067 | 409.5263 | 421.5343 | 435.9231 | 462.0620 | 479.6789 | (73) |

|                |                        |                                            |                                   |                                    |                              |            |      |  |
|----------------|------------------------|--------------------------------------------|-----------------------------------|------------------------------------|------------------------------|------------|------|--|
| 6. Solar gains |                        |                                            |                                   |                                    |                              |            |      |  |
| [Jan]          | Area<br>m <sup>2</sup> | Solar flux<br>Table 6a<br>W/m <sup>2</sup> | 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 |      |  |
| South          | 6.5000                 | 46.7521                                    | 0.6300                            | 0.8000                             | 0.7700                       | 106.1397   | (78) |  |
| West           | 3.3800                 | 19.6403                                    | 0.6300                            | 0.8000                             | 0.7700                       | 23.1861    | (80) |  |

# Full SAP Calculation Printout



|             |          |          |          |           |           |           |           |          |          |          |          |          |      |               |  |
|-------------|----------|----------|----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|------|---------------|--|
| South       |          |          |          | 6.5000    |           | 46.7521   |           | 0.6300   |          | 0.8000   |          | 0.7700   |      | 106.1397 (78) |  |
| <hr/>       |          |          |          |           |           |           |           |          |          |          |          |          |      |               |  |
| Solar gains | 235.4655 | 393.0160 | 517.5523 | 609.4636  | 655.0867  | 638.6178  | 620.5489  | 588.0459 | 549.4903 | 428.8027 | 280.5339 | 202.4961 | (83) |               |  |
| Total gains | 724.9375 | 892.7018 | 997.2811 | 1072.0111 | 1094.8327 | 1062.6385 | 1028.9556 | 997.5722 | 971.0246 | 864.7258 | 742.5959 | 682.1750 | (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                                                                         | 20.5080 | 20.5788 | 20.6501 | 21.0140 | 21.0883 | 21.4679 | 21.4679 | 21.5455 | 21.3144 | 21.0883 | 20.9402 | 20.7941 |              |
| alpha                                                                       | 2.3672  | 2.3719  | 2.3767  | 2.4009  | 2.4059  | 2.4312  | 2.4312  | 2.4364  | 2.4210  | 2.4059  | 2.3960  | 2.3863  |              |
| util living area                                                            | 0.8188  | 0.7445  | 0.6685  | 0.5683  | 0.4609  | 0.3411  | 0.2493  | 0.2667  | 0.3957  | 0.5916  | 0.7532  | 0.8345  | (86)         |
| Living                                                                      | 19.1320 | 19.5909 | 20.0226 | 20.4522 | 20.7379 | 20.9109 | 20.9697 | 20.9634 | 20.8643 | 20.4874 | 19.7763 | 19.0542 |              |
| Non living                                                                  | 17.9825 | 18.5428 | 19.0667 | 19.5865 | 19.9161 | 20.1136 | 20.1692 | 20.1667 | 20.0635 | 19.6413 | 18.7911 | 17.8943 |              |
| 24 / 16                                                                     | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       |              |
| 24 / 9                                                                      | 3       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       |              |
| 16 / 9                                                                      | 28      | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 10      |              |
| MIT                                                                         | 20.0444 | 19.5909 | 20.0226 | 20.4522 | 20.7379 | 20.9109 | 20.9697 | 20.9634 | 20.8643 | 20.4874 | 19.7763 | 19.3264 | (87)         |
| Th 2                                                                        | 20.1549 | 20.1575 | 20.1602 | 20.1736 | 20.1762 | 20.1897 | 20.1897 | 20.1924 | 20.1843 | 20.1762 | 20.1709 | 20.1655 | (88)         |
| util rest of house                                                          | 0.8044  | 0.7265  | 0.6465  | 0.5414  | 0.4280  | 0.3021  | 0.2055  | 0.2223  | 0.3552  | 0.5600  | 0.7328  | 0.8211  | (89)         |
| MIT 2                                                                       | 19.2888 | 18.5428 | 19.0667 | 19.5865 | 19.9161 | 20.1136 | 20.1692 | 20.1667 | 20.0635 | 19.6413 | 18.7911 | 18.3035 | (90)         |
| Living area fraction                                                        |         |         |         |         |         |         |         |         |         |         |         |         |              |
| MIT                                                                         | 19.7096 | 19.1264 | 19.5990 | 20.0686 | 20.3737 | 20.5576 | 20.6149 | 20.6104 | 20.5094 | 20.1124 | 19.3397 | 18.8731 | (92)         |
| Temperature adjustment                                                      |         |         |         |         |         |         |         |         |         |         |         | 0.0000  |              |
| adjusted MIT                                                                | 19.7096 | 19.1264 | 19.5990 | 20.0686 | 20.3737 | 20.5576 | 20.6149 | 20.6104 | 20.5094 | 20.1124 | 19.3397 | 18.8731 | (93)         |

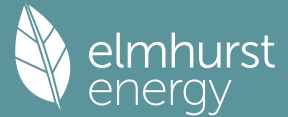
## 8. Space heating requirement

|                                                                                |          |          |          |          |          |          |          |          |          |          |          |           |       |
|--------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------|
|                                                                                | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec       |       |
| Utilisation                                                                    | 0.7962   | 0.7023   | 0.6308   | 0.5378   | 0.4361   | 0.3200   | 0.2287   | 0.2455   | 0.3716   | 0.5575   | 0.7101   | 0.7974    | (94)  |
| Useful gains                                                                   | 577.2152 | 626.9366 | 629.0941 | 576.5593 | 477.4260 | 340.0413 | 235.2863 | 244.9138 | 360.8109 | 482.0609 | 527.3329 | 543.9869  | (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                                                               | 967.1375 | 889.8107 | 816.4671 | 684.0873 | 529.4020 | 357.1920 | 240.7180 | 251.5270 | 387.0487 | 580.5930 | 752.3388 | 908.2461  | (97)  |
| Space heating kWh                                                              | 290.1022 | 176.6513 | 139.4055 | 77.4201  | 38.6701  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 73.3079  | 162.0043 | 271.0088  | (98a) |
| Space heating requirement - total per year (kWh/year)                          |          |          |          |          |          |          |          |          |          |          |          | 1228.5703 |       |
| 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                                                              | 290.1022 | 176.6513 | 139.4055 | 77.4201  | 38.6701  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 73.3079  | 162.0043 | 271.0088  | (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) |          |          |          |          |          |          |          |          |          |          |          | 1228.5703 |       |
| Space heating per m2                                                           |          |          |          |          |          |          |          |          |          |          |          | 17.9092   | (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 %)                                                             |          |          |          |          |          |          |          |          |          |          |          |          | 224.8044 (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                                                                                    | 290.1022 | 176.6513 | 139.4055 | 77.4201  | 38.6701  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 73.3079  | 162.0043 | 271.0088 | (98)           |
| Space heating efficiency (main heating system 1)                                                             | 224.8044 | 224.8044 | 224.8044 | 224.8044 | 224.8044 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 224.8044 | 224.8044 | 224.8044 | (210)          |
| Space heating fuel (main heating system)                                                                     | 129.0465 | 78.5800  | 62.0119  | 34.4389  | 17.2017  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 32.6096  | 72.0645  | 120.5531 | (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                                                                                    | 247.2843 | 218.7380 | 232.3300 | 203.9547 | 197.5371 | 177.7962 | 175.2377 | 182.2476 | 184.3222 | 205.7947 | 219.1728 | 244.5255 | (64)           |
| Efficiency of water heater (217)m                                                                            | 322.9383 | 322.9383 | 322.9383 | 322.9383 | 322.9383 | 322.9383 | 322.9383 | 322.9383 | 322.9383 | 322.9383 | 322.9383 | 322.9383 | (216)          |
| Fuel for water heating, kWh/month                                                                            | 76.5732  | 67.7337  | 71.9425  | 63.1559  | 61.1687  | 55.0558  | 54.2635  | 56.4342  | 57.0766  | 63.7257  | 67.8683  | 75.7190  | (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                                                                                                 | 11.9949  | 10.8341  | 11.9949  | 11.6080  | 11.9949  | 11.6080  | 11.9949  | 11.9949  | 11.6080  | 11.9949  | 11.6080  | 11.9949  | (231)          |
| Lighting                                                                                                     | 19.5473  | 15.6815  | 14.1195  | 10.3445  | 7.9904   | 6.5282   | 7.2891   | 9.4747   | 12.3067  | 16.1470  | 18.2380  | 20.0905  | (232)          |
| Electricity generated by PVs (Appendix M) (negative quantity) (233a)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   | (233a)         |
| Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (234a)         |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m                  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (235a)         |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (235c)         |
| Electricity generated by PVs (Appendix M) (negative quantity) (233b)m                                        | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (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                                                                           |          |          |          |          |          |          |          |          |          |          |          | 546.5063 | (211)          |
| Space heating fuel - main system 2                                                                           |          |          |          |          |          |          |          |          |          |          |          | 0.0000   | (213)          |

# Full SAP Calculation Printout



|                                                                                                               |                 |
|---------------------------------------------------------------------------------------------------------------|-----------------|
| Space heating fuel - secondary                                                                                | 0.0000 (215)    |
| Efficiency of water heater                                                                                    | 322.9383        |
| Water heating fuel used                                                                                       | 770.7171 (219)  |
| Space cooling fuel                                                                                            | 0.0000 (221)    |
| Electricity for pumps and fans:<br>(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750) |                 |
| mechanical ventilation fans (SFP = 0.6750)                                                                    | 141.2302 (230a) |
| Total electricity for the above, kWh/year                                                                     | 141.2302 (231)  |
| Electricity for lighting (calculated in Appendix L)                                                           | 157.7577 (232)  |
| Energy saving/generation technologies (Appendices M ,N and Q)                                                 |                 |
| PV generation                                                                                                 | 0.0000 (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                                                                           | 1616.2113 (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                   | 546.5063           | 0.1560                        | 85.2574 (261)            |
| Total CO2 associated with community systems     |                    |                               | 0.0000 (373)             |
| Water heating (other fuel)                      | 770.7171           | 0.1409                        | 108.6025 (264)           |
| Space and water heating                         |                    |                               | 193.8599 (265)           |
| Pumps, fans and electric keep-hot               | 141.2302           | 0.1387                        | 19.5904 (267)            |
| Energy for lighting                             | 157.7577           | 0.1443                        | 22.7693 (268)            |
| Total CO2, kg/year                              |                    |                               | 236.2196 (272)           |
| EPC Dwelling Carbon Dioxide Emission Rate (DER) |                    |                               | 3.4400 (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               | 546.5063           | 1.5775                              | 862.1041 (275)             |
| Total CO2 associated with community systems |                    |                                     | 0.0000 (473)               |
| Water heating (other fuel)                  | 770.7171           | 1.5210                              | 1172.2903 (278)            |
| Space and water heating                     |                    |                                     | 2034.3945 (279)            |
| Pumps, fans and electric keep-hot           | 141.2302           | 1.5128                              | 213.6531 (281)             |
| Energy for lighting                         | 157.7577           | 1.5338                              | 241.9740 (282)             |
| Total Primary energy kWh/year               |                    |                                     | 2490.0215 (286)            |
| Dwelling Primary energy Rate (DPER)         |                    |                                     | 36.3000 (287)              |

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

### 1. Overall dwelling characteristics

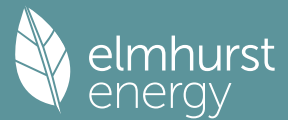
|                                                        | Area<br>(m2) | Storey height<br>(m)            | Volume<br>(m3)         |
|--------------------------------------------------------|--------------|---------------------------------|------------------------|
| Main dwelling                                          | 68.6000 (1b) | x 2.5000 (2b)                   | = 171.5000 (1b) - (3b) |
| Ground floor                                           |              |                                 |                        |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 68.6000      |                                 | (4)                    |
| Dwelling volume                                        |              | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 171.5000 (5)         |

### 2. Ventilation rate

|                                                      | m3 per hour                                                                      |
|------------------------------------------------------|----------------------------------------------------------------------------------|
| Number of open chimneys                              | 0 * 80 = 0.0000 (6a)                                                             |
| Number of open flues                                 | 0 * 20 = 0.0000 (6b)                                                             |
| Number of chimneys / flues attached to closed fire   | 0 * 10 = 0.0000 (6c)                                                             |
| Number of flues attached to solid fuel boiler        | 0 * 20 = 0.0000 (6d)                                                             |
| Number of flues attached to other heater             | 0 * 35 = 0.0000 (6e)                                                             |
| Number of blocked chimneys                           | 0 * 20 = 0.0000 (6f)                                                             |
| Number of intermittent extract fans                  | 2 * 10 = 20.0000 (7a)                                                            |
| 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) = 20.0000 / (5) = 0.1166 (8) |
| Pressure test                                        | Yes                                                                              |
| Pressure Test Method                                 | Blower Door                                                                      |
| Measured/design AP50                                 | 5.0000 (17)                                                                      |
| Infiltration rate                                    | 0.3666 (18)                                                                      |
| Number of sides sheltered                            | 2 (19)                                                                           |
| Shelter factor                                       | (20) = 1 - [0.075 x (19)] = 0.8500 (20)                                          |
| Infiltration rate adjusted to include shelter factor | (21) = (18) x (20) = 0.3116 (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 | 0.3973 | 0.3895 | 0.3817 | 0.3428 | 0.3350 | 0.2960 | 0.2960 | 0.2883 | 0.3116 | 0.3350 | 0.3506 | 0.3662 (22b) |
| Effective ac    | 0.5789 | 0.5759 | 0.5729 | 0.5588 | 0.5561 | 0.5438 | 0.5438 | 0.5415 | 0.5486 | 0.5561 | 0.5615 | 0.5670 (25)  |

# Full SAP Calculation Printout



## 3. Heat losses and heat loss parameter

| Element                                                             | Gross          | Openings       | NetArea              | U-value        | A x U          | K-value               | A x K          |                |                |                |                |                |      |
|---------------------------------------------------------------------|----------------|----------------|----------------------|----------------|----------------|-----------------------|----------------|----------------|----------------|----------------|----------------|----------------|------|
| Main dwelling                                                       | m2             | m2             | m2                   | W/m2K          | W/K            | kJ/m2K                | kJ/K           |                |                |                |                |                |      |
| TER Opaque door                                                     |                |                | 2.1000               | 1.0000         | 2.1000         |                       |                | (26)           |                |                |                |                |      |
| TER Opening Type                                                    |                |                | 15.0500              | 1.1450         | 17.2328        |                       |                | (27)           |                |                |                |                |      |
| top floor exposed new                                               | 42.2500        | 15.0500        | 27.2000              | 0.1800         | 4.8960         |                       |                | (29a)          |                |                |                |                |      |
| corridor new                                                        | 18.2500        | 2.1000         | 16.1500              | 0.1800         | 2.9070         |                       |                | (29a)          |                |                |                |                |      |
| flat roof new                                                       | 31.6000        |                | 31.6000              | 0.1100         | 3.4760         |                       |                | (30)           |                |                |                |                |      |
| roof terrace new                                                    | 37.0000        |                | 37.0000              | 0.1100         | 4.0700         |                       |                | (30)           |                |                |                |                |      |
| Total net area of external elements Aum(A, m2)                      |                |                | 129.1000             |                |                |                       |                | (31)           |                |                |                |                |      |
| Fabric heat loss, W/K = Sum (A x U)                                 |                |                | (26)...(30) + (32) = |                | 34.6818        |                       |                | (33)           |                |                |                |                |      |
| Main dwelling                                                       |                |                |                      |                |                |                       |                |                |                |                |                |                |      |
| pw                                                                  |                |                | 27.2500              | 0.0000         | 0.0000         |                       |                | (32)           |                |                |                |                |      |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                   |                |                |                      |                |                |                       | 67.5461        | (35)           |                |                |                |                |      |
| List of Thermal Bridges                                             |                |                |                      |                |                |                       |                |                |                |                |                |                |      |
| K1 Element                                                          |                |                |                      | Length         | Psi-value      |                       | Total          |                |                |                |                |                |      |
| E2 Other lintels (including other steel lintels)                    |                |                |                      | 7.5500         | 0.0500         |                       | 0.3775         |                |                |                |                |                |      |
| E3 Sill                                                             |                |                |                      | 6.5500         | 0.0500         |                       | 0.3275         |                |                |                |                |                |      |
| E4 Jamb                                                             |                |                |                      | 19.2000        | 0.0500         |                       | 0.9600         |                |                |                |                |                |      |
| E7 Party floor between dwellings (in blocks of flats)               |                |                |                      | 0.0000         | 0.0700         |                       | 0.0000         |                |                |                |                |                |      |
| E14 Flat roof                                                       |                |                |                      | 0.0000         | 0.0800         |                       | 0.0000         |                |                |                |                |                |      |
| E15 Flat roof with parapet                                          |                |                |                      | 17.0000        | 0.5600         |                       | 9.5200         |                |                |                |                |                |      |
| E16 Corner (normal)                                                 |                |                |                      | 2.5000         | 0.0900         |                       | 0.2250         |                |                |                |                |                |      |
| E18 Party wall between dwellings                                    |                |                |                      | 5.0000         | 0.0600         |                       | 0.3000         |                |                |                |                |                |      |
| E24 Eaves (insulation at ceiling level - inverted)                  |                |                |                      | 17.0000        | 0.2400         |                       | 4.0800         |                |                |                |                |                |      |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)          |                |                |                      |                |                |                       | 15.7900        | (36)           |                |                |                |                |      |
| Point Thermal bridges                                               |                |                |                      |                |                | (36a) =               | 0.0000         |                |                |                |                |                |      |
| Total fabric heat loss                                              |                |                |                      |                |                | (33) + (36) + (36a) = | 50.4718        | (37)           |                |                |                |                |      |
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) |                |                |                      |                |                |                       |                |                |                |                |                |                |      |
| (38)m                                                               | Jan<br>32.7647 | Feb<br>32.5912 | Mar<br>32.4212       | Apr<br>31.6226 | May<br>31.4731 | Jun<br>30.7776        | Jul<br>30.7776 | Aug<br>30.6487 | Sep<br>31.0455 | Oct<br>31.4731 | Nov<br>31.7754 | Dec<br>32.0914 | (38) |
| Heat transfer coeff                                                 | 83.2365        | 83.0630        | 82.8930              | 82.0944        | 81.9450        | 81.2494               | 81.2494        | 81.1206        | 81.5173        | 81.9450        | 82.2472        | 82.5633        | (39) |
| Average = Sum(39)m / 12 =                                           |                |                |                      |                |                |                       |                |                |                |                |                | 82.0937        |      |
| HLP                                                                 | Jan<br>1.2134  | Feb<br>1.2108  | Mar<br>1.2084        | Apr<br>1.1967  | May<br>1.1945  | Jun<br>1.1844         | Jul<br>1.1844  | Aug<br>1.1825  | Sep<br>1.1883  | Oct<br>1.1945  | Nov<br>1.1989  | Dec<br>1.2035  | (40) |
| HLP (average)                                                       |                |                |                      |                |                |                       |                |                |                |                |                | 1.1967         |      |
| Days in mont                                                        | 31             | 28             | 31                   | 30             | 31             | 30                    | 31             | 31             | 30             | 31             | 30             | 31             |      |

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

|                                                                                |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
|--------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------------------------------------|--------------------|----------|-----------|----------|------|
| Assumed occupancy                                                              |          |          |          |          |          |          |          |          |                                        |                    |          |           | 2.2117   | (42) |
| Hot water usage for mixer showers                                              |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 61.3019                                                                        | 60.3807  | 59.0382  | 56.4697  | 54.5742  | 52.4604  | 51.2589  | 52.5911  | 54.0516  | 56.3212                                | 58.9449            | 61.0671  | 61.0671   | (42a)    |      |
| Hot water usage for baths                                                      |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 26.4851                                                                        | 26.0917  | 25.5378  | 24.5165  | 23.7518  | 22.9038  | 22.4458  | 22.9958  | 23.5947  | 24.5020                                | 25.5444            | 26.3955  | 26.3955   | (42b)    |      |
| Hot water usage for other uses                                                 |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 37.2796                                                                        | 35.9240  | 34.5684  | 33.2128  | 31.8571  | 30.5015  | 30.5015  | 31.8571  | 33.2128  | 34.5684                                | 35.9240            | 37.2796  | 37.2796   | (42c)    |      |
| Average daily hot water use (litres/day)                                       |          |          |          |          |          |          |          |          |                                        |                    |          |           | 114.9647 | (43) |
|                                                                                | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep                                    | Oct                | Nov      | Dec       |          |      |
| Daily hot water use                                                            |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 125.0666                                                                       | 122.3964 | 119.1444 | 114.1990 | 110.1831 | 105.8657 | 104.2061 | 107.4441 | 110.8590 | 115.3916                               | 120.4133           | 124.7422 | 124.7422  | (44)     |      |
| Energy content (annual)                                                        | 198.0749 | 174.2908 | 183.1206 | 156.3327 | 148.3277 | 130.1742 | 126.0283 | 133.0382 | 136.7002                               | 156.5853           | 171.5508 | 195.3161  | (45)     |      |
| Distribution loss (46)m = 0.15 x (45)m                                         |          |          |          |          |          |          |          |          |                                        | Total = Sum(45)m = |          | 1909.5399 |          |      |
| 29.7112                                                                        | 26.1436  | 27.4681  | 23.4499  | 22.2491  | 19.5261  | 18.9042  | 19.9557  | 20.5050  | 23.4878                                | 25.7326            | 29.2974  | 29.2974   | (46)     |      |
| Water storage loss:                                                            |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| Store volume                                                                   |          |          |          |          |          |          |          |          |                                        |                    |          |           | 150.0000 | (47) |
| a) If manufacturer declared loss factor is known (kWh/day):                    |          |          |          |          |          |          |          |          |                                        |                    |          |           | 1.3938   | (48) |
| Temperature factor from Table 2b                                               |          |          |          |          |          |          |          |          |                                        |                    |          |           | 0.5400   | (49) |
| Enter (49) or (54) in (55)                                                     |          |          |          |          |          |          |          |          |                                        |                    |          |           | 0.7527   | (55) |
| Total storage loss                                                             |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 23.3325                                                                        | 21.0745  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | 23.3325  | 22.5798  | 23.3325                                | 22.5798            | 23.3325  | 23.3325   | (56)     |      |
| If cylinder contains dedicated solar storage                                   |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 23.3325                                                                        | 21.0745  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | 23.3325  | 22.5798  | 23.3325                                | 22.5798            | 23.3325  | 23.3325   | (57)     |      |
| Primary loss                                                                   | 23.2624  | 21.0112  | 23.2624  | 22.5120  | 23.2624  | 22.5120  | 23.2624  | 23.2624  | 22.5120                                | 23.2624            | 22.5120  | 23.2624   | (59)     |      |
| Comb 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                |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 244.6698                                                                       | 216.3766 | 229.7155 | 201.4245 | 194.9226 | 175.2661 | 172.6232 | 179.6331 | 181.7921 | 203.1802                               | 216.6426           | 241.9110 | 241.9110  | (62)     |      |
| WWHRS                                                                          | -28.0247 | -24.7853 | -25.9537 | -21.4907 | -20.0285 | -17.1386 | -16.0647 | -17.0832 | -17.7322                               | -20.9043           | -23.6821 | -27.5057  | (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                                                                |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 216.6452                                                                       | 191.5913 | 203.7618 | 179.9339 | 174.8940 | 158.1275 | 156.5585 | 162.5499 | 164.0599 | 182.2759                               | 192.9605           | 214.4053 | 214.4053  | (64)     |      |
| 12Total per year (kWh/year)                                                    |          |          |          |          |          |          |          |          | Total per year (kWh/year) = Sum(64)m = |                    |          | 2197.7637 | (64)     |      |
| Electric shower(s)                                                             |          |          |          |          |          |          |          |          |                                        |                    |          | 2198      | (64)     |      |
| 0.0000                                                                         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                 | 0.0000             | 0.0000   | 0.0000    | (64a)    |      |
| Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = |          |          |          |          |          |          |          |          |                                        |                    |          | 0.0000    | (64a)    |      |
| Heat gains from water heating, kWh/month                                       |          |          |          |          |          |          |          |          |                                        |                    |          |           |          |      |
| 103.1358                                                                       | 91.6203  | 98.1635  | 88.0541  | 86.5949  | 79.3564  | 79.1803  | 81.5111  | 81.5263  | 89.3405                                | 93.1141            | 102.2185 | 102.2185  | (65)     |      |

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

|                                                                                     |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
|-------------------------------------------------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|
| Metabolic gains (Table 5), Watts                                                    |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| (66)m                                                                               | Jan<br>110.5831 | Feb<br>110.5831 | Mar<br>110.5831 | Apr<br>110.5831 | May<br>110.5831 | Jun<br>110.5831 | Jul<br>110.5831 | Aug<br>110.5831 | Sep<br>110.5831 | Oct<br>110.5831 | Nov<br>110.5831 | Dec<br>110.5831 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 97.8973                                                                             | 108.3863        | 97.8973         | 101.1606        | 97.8973         | 101.1606        | 97.8973         | 97.8973         | 101.1606        | 97.8973         | 101.1606        | 97.8973         | 97.8973         | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 194.0077                                                                            | 196.0209        | 190.9477        | 180.1475        | 166.5142        | 153.7008        | 145.1407        | 143.1275        | 148.2007        | 159.0009        | 172.6342        | 185.4476        | 185.4476        | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 34.0583                                                                             | 34.0583         | 34.0583         | 34.0583         | 34.0583         | 34.0583         | 34.0583         | 34.0583         | 34.0583         | 34.0583         | 34.0583         | 34.0583         | 34.0583         | (69) |
| Pumps, fans                                                                         | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 0.0000          | 0.0000          | 0.0000          | 0.0000          | 3.0000          | 3.0000          | 3.0000          | (70) |

# Full SAP Calculation Printout



|                                                     |          |          |          |          |          |          |          |          |          |          |          |               |
|-----------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| Losses e.g. evaporation (negative values) (Table 5) | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 | -88.4665 (71) |
| Water heating gains (Table 5)                       | 138.6234 | 136.3397 | 131.9402 | 122.2974 | 116.3910 | 110.2172 | 106.4252 | 109.5580 | 113.2310 | 120.0814 | 129.3251 | 137.3905 (72) |
| Total internal gains                                | 489.7034 | 499.9219 | 479.9602 | 462.7804 | 439.9774 | 421.2535 | 405.6381 | 406.7577 | 418.7672 | 436.1545 | 462.2948 | 479.9104 (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    |               |
|-------------|----------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|----------|----------|---------------|---------------|
| South       |          |          |          | 11.9400    | 46.7521                        | 0.6300                            | 0.7000                             | 0.7700                       |          |          | 170.5992 (78) |               |
| West        |          |          |          | 3.1100     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       |          |          | 18.6672 (80)  |               |
| Solar gains | 189.2664 | 315.9145 | 416.0412 | 489.9557   | 526.6565                       | 513.4258                          | 498.8952                           | 472.7474                     | 441.7259 | 344.6870 | 225.4940      | 162.7644 (83) |
| Total gains | 678.9698 | 815.8364 | 896.0014 | 952.7361   | 966.6339                       | 934.6794                          | 904.5333                           | 879.5051                     | 860.4931 | 780.8415 | 687.7889      | 642.6748 (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, n <sub>l,m</sub> (see Table 9a) | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep                                   | Oct     | Nov     | Dec          |
| tau                                                                           | 15.4635 | 15.4958 | 15.5276 | 15.6786 | 15.7072 | 15.8417 | 15.8417 | 15.8668 | 15.7896                               | 15.7072 | 15.6495 | 15.5896      |
| alpha                                                                         | 2.0309  | 2.0331  | 2.0352  | 2.0452  | 2.0471  | 2.0561  | 2.0561  | 2.0578  | 2.0526                                | 2.0471  | 2.0433  | 2.0393       |
| util living area                                                              | 0.8653  | 0.8162  | 0.7627  | 0.6855  | 0.5895  | 0.4676  | 0.3576  | 0.3792  | 0.5235                                | 0.7007  | 0.8208  | 0.8763 (86)  |
| MIT                                                                           | 18.1147 | 18.5835 | 19.1318 | 19.7682 | 20.3031 | 20.6982 | 20.8761 | 20.8554 | 20.5931                               | 19.8944 | 18.9066 | 18.0256 (87) |
| Th 2                                                                          | 19.9093 | 19.9113 | 19.9133 | 19.9226 | 19.9244 | 19.9325 | 19.9325 | 19.9340 | 19.9294                               | 19.9244 | 19.9208 | 19.9172 (88) |
| util rest of house                                                            | 0.8514  | 0.7984  | 0.7397  | 0.6542  | 0.5459  | 0.4070  | 0.2813  | 0.3033  | 0.4649                                | 0.6645  | 0.8004  | 0.8634 (89)  |
| MIT 2                                                                         | 16.6119 | 17.1850 | 17.8549 | 18.6246 | 19.2496 | 19.6874 | 19.8570 | 19.8417 | 19.5816                               | 18.7931 | 17.6006 | 16.5051 (90) |
| Living area fraction                                                          |         |         |         |         |         |         |         |         | f <sub>LA</sub> = Living area / (4) = |         |         | 0.5569 (91)  |
| MIT                                                                           | 17.4487 | 17.9637 | 18.5659 | 19.2614 | 19.8362 | 20.2503 | 20.4244 | 20.4062 | 20.1449                               | 19.4064 | 18.3279 | 17.3518 (92) |
| Temperature adjustment                                                        |         |         |         |         |         |         |         |         |                                       |         |         | 0.0000       |
| adjusted MIT                                                                  | 17.4487 | 17.9637 | 18.5659 | 19.2614 | 19.8362 | 20.2503 | 20.4244 | 20.4062 | 20.1449                               | 19.4064 | 18.3279 | 17.3518 (93) |

## 8. Space heating requirement

|                                                                                |           |           |           |          |          |          |          |          |          |               |          |                |
|--------------------------------------------------------------------------------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|---------------|----------|----------------|
| Utilisation                                                                    | Jan       | Feb       | Mar       | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct           | Nov      | Dec            |
|                                                                                | 0.8117    | 0.7600    | 0.7066    | 0.6329   | 0.5421   | 0.4258   | 0.3175   | 0.3380   | 0.4773   | 0.6450        | 0.7639   | 0.8243 (94)    |
| Useful gains                                                                   | 551.1516  | 620.0351  | 633.1442  | 602.9664 | 524.0030 | 397.9745 | 287.1616 | 297.2527 | 410.7468 | 503.6443      | 525.4239 | 529.7264 (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                                                               | 1094.4555 | 1085.1135 | 1000.1800 | 850.6142 | 666.7243 | 459.0814 | 310.7338 | 324.9861 | 492.7610 | 721.6373      | 923.4614 | 1085.8560 (97) |
| Space heating kWh                                                              | 404.2181  | 312.5327  | 273.0746  | 178.3064 | 106.1847 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 162.1868      | 286.5870 | 413.7604 (98a) |
| Space heating requirement - total per year (kWh/year)                          |           |           |           |          |          |          |          |          |          |               |          | 2136.8506      |
| 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                                                              | 404.2181  | 312.5327  | 273.0746  | 178.3064 | 106.1847 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 162.1868      | 286.5870 | 413.7604 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) |           |           |           |          |          |          |          |          |          |               |          | 2136.8506      |
| Space heating per m2                                                           |           |           |           |          |          |          |          |          |          | (98c) / (4) = |          | 31.1494 (99)   |

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

|                                                                                             |          |          |          |          |           |          |          |          |          |          |          |                 |
|---------------------------------------------------------------------------------------------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|----------|-----------------|
| Fraction of space heat from secondary/supplementary system (Table 11)                       |          |          |          |          |           |          |          |          |          |          |          | 0.0000 (201)    |
| Fraction of space heat from main system(s)                                                  |          |          |          |          |           |          |          |          |          |          |          | 1.0000 (202)    |
| Efficiency of main space heating system 1 (in %)                                            |          |          |          |          |           |          |          |          |          |          |          | 92.3000 (206)   |
| Efficiency of main space heating system 2 (in %)                                            |          |          |          |          |           |          |          |          |          |          |          | 0.0000 (207)    |
| Efficiency of secondary/supplementary heating system, %                                     |          |          |          |          |           |          |          |          |          |          |          | 0.0000 (208)    |
| Space heating requirement                                                                   | Jan      | Feb      | Mar      | Apr      | May       | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec             |
|                                                                                             | 404.2181 | 312.5327 | 273.0746 | 178.3064 | 106.1847  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 162.1868 | 286.5870 | 413.7604 (98)   |
| Space heating efficiency (main heating system 1)                                            | 92.3000  | 92.3000  | 92.3000  | 92.3000  | 92.3000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 92.3000  | 92.3000  | 92.3000 (210)   |
| Space heating fuel (main heating system)                                                    | 437.9395 | 338.6053 | 295.8554 | 193.1814 | 115.0430  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 175.7170 | 310.4951 | 448.2777 (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                                                                   | 216.6452 | 191.5913 | 203.7618 | 179.9339 | 174.8940  | 158.1275 | 156.5585 | 162.5499 | 164.0599 | 182.2759 | 192.9605 | 214.4053 (64)   |
| Efficiency of water heater (217)m                                                           | 85.4377  | 85.1502  | 84.7171  | 84.0394  | 82.9770   | 79.8000  | 79.8000  | 79.8000  | 79.8000  | 83.7989  | 84.9451  | 79.8000 (216)   |
| Fuel for water heating, kWh/month                                                           | 253.5710 | 225.0038 | 240.5201 | 214.1065 | 210.7740  | 198.1547 | 196.1886 | 203.6967 | 205.5888 | 217.5159 | 227.1591 | 250.7419 (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                                                                                    | 20.3411  | 16.3184  | 14.6929  | 10.7647  | 8.3149    | 6.7934   | 7.5852   | 9.8595   | 12.8065  | 16.8028  | 18.9787  | 20.9065 (232)   |
| Electricity generated by PVs (Appendix M) (negative quantity) (233a)m                       | -53.4034 | -70.4071 | -94.7555 | -99.5917 | -101.9525 | -93.3416 | -92.1918 | -89.5894 | -84.3595 | -77.0462 | -56.9515 | -46.7686 (233a) |
| Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m             | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (234a)   |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235a)   |

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|                                                                                                      |          |          |           |           |           |           |           |           |           |           |          |          |            |        |
|------------------------------------------------------------------------------------------------------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|----------|------------|--------|
| 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   | 0.0000     | (235c) |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        |          |          |           |           |           |           |           |           |           |           |          |          |            |        |
| (233b)m                                                                                              | -47.0405 | -96.3626 | -186.9429 | -274.4175 | -356.9365 | -356.4914 | -352.2599 | -300.8667 | -224.1062 | -135.5230 | -62.0254 | -37.3954 | (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                                                                   |          |          |           |           |           |           |           |           |           |           |          |          | 2315.1144  | (211)  |
| Space heating fuel - main system 2                                                                   |          |          |           |           |           |           |           |           |           |           |          |          | 0.0000     | (213)  |
| Space heating fuel - secondary                                                                       |          |          |           |           |           |           |           |           |           |           |          |          | 0.0000     | (215)  |
| Efficiency of water heater                                                                           |          |          |           |           |           |           |           |           |           |           |          |          | 79.8000    |        |
| Water heating fuel used                                                                              |          |          |           |           |           |           |           |           |           |           |          |          | 2643.0213  | (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)                                                  |          |          |           |           |           |           |           |           |           |           |          |          | 164.1646   | (232)  |
| Energy saving/generation technologies (Appendices M ,N and Q)                                        |          |          |           |           |           |           |           |           |           |           |          |          |            |        |
| PV generation                                                                                        |          |          |           |           |           |           |           |           |           |           |          |          | -3390.7268 | (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                                                                  |          |          |           |           |           |           |           |           |           |           |          |          | 1817.5735  | (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                 | 2315.1144          | 0.2100                        | 486.1740                 | (261) |
| Total CO2 associated with community systems   |                    |                               | 0.0000                   | (373) |
| Water heating (other fuel)                    | 2643.0213          | 0.2100                        | 555.0345                 | (264) |
| Space and water heating                       |                    |                               | 1041.2085                | (265) |
| Pumps, fans and electric keep-hot             | 86.0000            | 0.1387                        | 11.9293                  | (267) |
| Energy for lighting                           | 164.1646           | 0.1443                        | 23.6940                  | (268) |
| Energy saving/generation technologies         |                    |                               |                          |       |
| PV Unit electricity used in dwelling          | -960.3587          | 0.1360                        | -130.6282                |       |
| PV Unit electricity exported                  | -2430.3680         | 0.1266                        | -307.6542                |       |
| Total                                         |                    |                               | -438.2824                | (269) |
| Total CO2, kg/year                            |                    |                               | 638.5494                 | (272) |
| EPC Target Carbon Dioxide Emission Rate (TER) |                    |                               | 9.3100                   | (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               | 2315.1144          | 1.1300                              | 2616.0793                  | (275) |
| Total CO2 associated with community systems |                    |                                     | 0.0000                     | (473) |
| Water heating (other fuel)                  | 2643.0213          | 1.1300                              | 2986.6140                  | (278) |
| Space and water heating                     |                    |                                     | 5602.6933                  | (279) |
| Pumps, fans and electric keep-hot           | 86.0000            | 1.5128                              | 130.1008                   | (281) |
| Energy for lighting                         | 164.1646           | 1.5338                              | 251.8011                   | (282) |
| Energy saving/generation technologies       |                    |                                     |                            |       |
| PV Unit electricity used in dwelling        | -960.3587          | 1.5028                              | -1443.2131                 |       |
| PV Unit electricity exported                | -2430.3680         | 0.4647                              | -1129.3774                 |       |
| Total                                       |                    |                                     | -2572.5905                 | (283) |
| Total Primary energy kWh/year               |                    |                                     | 3412.0047                  | (286) |
| Target Primary Energy Rate (TPER)           |                    |                                     | 49.7400                    | (287) |