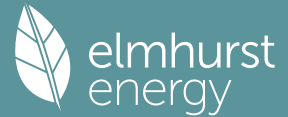


# Full SAP Calculation Printout



|                                    |                                                            |               |       |               |                |            |  |
|------------------------------------|------------------------------------------------------------|---------------|-------|---------------|----------------|------------|--|
| Property Reference                 | UNIT 36                                                    |               |       |               | Issued on Date | 02/07/2025 |  |
| Assessment Reference               | UNIT 36                                                    |               |       | Prop Type Ref |                |            |  |
| Property                           | Flat 37, Alexander House, 205 Kings Road, READING, RG1 4FW |               |       |               |                |            |  |
|                                    |                                                            |               |       |               |                |            |  |
| SAP Rating                         | 85 B                                                       | DER           | 3.70  | TER           | 10.60          |            |  |
| Environmental                      | 97 A                                                       | % DER < TER   |       |               |                | 65.09      |  |
| CO <sub>2</sub> Emissions (t/year) | 0.24                                                       | DFEE          | 39.11 | TFEE          | 44.96          |            |  |
| Compliance Check                   | See BREL                                                   | % DFEE < TFEE |       |               |                | 13.01      |  |
| % DPER < TPER                      | 31.35                                                      | DPER          | 38.92 | TPER          | 56.70          |            |  |
|                                    |                                                            |               |       |               |                |            |  |
| 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                                          |                           |                                 |                             |
| Ground floor                                           | 71.2000 (1b)              | 2.5000 (2b)                     | 178.0000 (1b) - (3b)        |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 71.2000                   |                                 | (4)                         |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 178.0000 (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                                                                               | 3.3700         | (17)       |
| Infiltration rate                                                                                  | 0.1685         | (18)       |
| Number of sides sheltered                                                                          | 2              | (19)       |

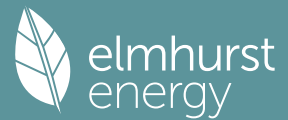
|                                                      |                             |             |
|------------------------------------------------------|-----------------------------|-------------|
| Shelter factor                                       | (20) = 1 - [0.075 x (19)] = | 0.8500 (20) |
| Infiltration rate adjusted to include shelter factor | (21) = (18) x (20) =        | 0.1432 (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                                                                                        | 0.1826 | 0.1790 | 0.1755 | 0.1575 | 0.1540 | 0.1361 | 0.1361 | 0.1325 | 0.1432 | 0.1540 | 0.1611 | 0.1683 (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                                                                                            | 0.2866 | 0.2830 | 0.2795 | 0.2615 | 0.2580 | 0.2401 | 0.2401 | 0.2365 | 0.2472 | 0.2580 | 0.2651 | 0.2723 (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                                                           |                         |                            | 6.5000                    | 1.1450                        | 7.4427       |                                | (27)            |
| 3                                                           |                         |                            | 6.5000                    | 1.1450                        | 7.4427       |                                | (27)            |
| 1                                                           |                         |                            | 2.1000                    | 1.0000                        | 2.1000       |                                | (26)            |
| top floor exposed new                                       | 58.7500                 | 19.5000                    | 39.2500                   | 0.2000                        | 7.8500       | 18.0000                        | 706.5000 (29a)  |
| corridor new                                                | 9.7500                  | 2.1000                     | 7.6500                    | 0.2300                        | 1.7595       | 14.0000                        | 107.1000 (29a)  |
| flat roof new                                               | 39.1000                 |                            | 39.1000                   | 0.1300                        | 5.0830       | 9.0000                         | 351.9000 (30)   |
| roof terrace new                                            | 32.1000                 |                            | 32.1000                   | 0.1300                        | 4.1730       | 9.0000                         | 288.9000 (30)   |
| Total net area of external elements Aum(A, m <sup>2</sup> ) |                         |                            | 139.7000                  |                               |              |                                | (31)            |
| Fabric heat loss, W/K = Sum (A x U)                         |                         |                            |                           | (26)...(30) + (32) =          | 43.2937      |                                | (33)            |
| Main dwelling                                               |                         |                            |                           |                               |              |                                |                 |
| pw                                                          |                         |                            | 16.0000                   | 0.0000                        | 0.0000       | 20.0000                        | 320.0000 (32)   |
| pf                                                          |                         |                            | 71.2000                   |                               |              | 30.0000                        | 2136.0000 (32d) |
| iw                                                          |                         |                            | 105.5000                  |                               |              | 9.0000                         | 949.5000 (32c)  |

# Full SAP Calculation Printout



Heat capacity  $C_m = \text{Sum}(A \times k)$   
Thermal mass parameter (TMP =  $C_m / \text{TFA}$ ) in  $\text{kJ/m}^2\text{K}$  (28)...(30) + (32) + (32a)...(32e) = 4859.9000 (34)  
List of Thermal Bridges 68.2570 (35)

|                                                                  | Length  | Psi-value | Total                              |
|------------------------------------------------------------------|---------|-----------|------------------------------------|
| K1 Element                                                       | 8.8000  | 0.0470    | 0.4136                             |
| E2 Other lintels (including other steel lintels)                 | 7.8000  | 0.0150    | 0.1170                             |
| E3 Sill                                                          | 19.2000 | 0.0470    | 0.9024                             |
| E4 Jamb                                                          | 0.0000  | 0.2800    | 0.0000                             |
| E7 Party floor between dwellings (in blocks of flats)            | 24.0000 | 0.1970    | 4.7280                             |
| E15 Flat roof with parapet                                       | 5.0000  | 0.1800    | 0.9000                             |
| E16 Corner (normal)                                              | 0.0000  | 0.0000    | 0.0000                             |
| E17 Corner (inverted - internal area greater than external area) | 5.0000  | 0.2400    | 1.2000                             |
| E18 Party wall between dwellings                                 | 24.0000 | 0.0500    | 1.2000                             |
| E24 Eaves (insulation at ceiling level - inverted)               |         |           | 9.4610 (36)                        |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)       |         |           | 0.0000                             |
| Point Thermal Bridges                                            |         |           | (36a) =                            |
| Total fabric heat loss                                           |         |           | (33) + (36) + (36a) = 52.7547 (37) |

|                                                                                        | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |      |
|----------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$ |         |         |         |         |         |         |         |         |         |         |         |         |      |
| (38)m                                                                                  | 16.8356 | 16.6253 | 16.4149 | 15.3633 | 15.1530 | 14.1013 | 14.1013 | 13.8910 | 14.5220 | 15.1530 | 15.5736 | 15.9943 | (38) |
| Heat transfer coeff                                                                    | 69.5903 | 69.3800 | 69.1697 | 68.1180 | 67.9077 | 66.8561 | 66.8561 | 66.6458 | 67.2767 | 67.9077 | 68.3284 | 68.7490 | (39) |
| Average = $\text{Sum}(39)\text{m} / 12 =$                                              |         |         |         |         |         |         |         |         |         |         |         | 68.0655 |      |
| HLP                                                                                    | 0.9774  | 0.9744  | 0.9715  | 0.9567  | 0.9538  | 0.9390  | 0.9390  | 0.9360  | 0.9449  | 0.9538  | 0.9597  | 0.9656  | (40) |
| HLP (average)                                                                          |         |         |         |         |         |         |         |         |         |         |         | 0.9560  |      |
| Days in mont                                                                           | 31      | 28      | 31      | 30      | 31      | 30      | 31      | 31      | 30      | 31      | 30      | 31      |      |

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

|                                                                                                |          |          |          |          |          |          |          |          |          |          |          |           |             |
|------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------------|
| Assumed occupancy                                                                              |          |          |          |          |          |          |          |          |          |          |          |           | 2.2749 (42) |
| Hot water usage for mixer showers                                                              | 62.3623  | 61.4251  | 60.0594  | 57.4465  | 55.5182  | 53.3678  | 52.1455  | 53.5008  | 54.9865  | 57.2954  | 59.9645  | 62.1233   | (42a)       |
| Hot water usage for baths                                                                      | 26.9410  | 26.5409  | 25.9775  | 24.9386  | 24.1607  | 23.2981  | 22.8322  | 23.3917  | 24.0009  | 24.9239  | 25.9842  | 26.8500   | (42b)       |
| Hot water usage for other uses                                                                 | 37.9273  | 36.5481  | 35.1689  | 33.7897  | 32.4106  | 31.0314  | 31.0314  | 32.4106  | 33.7897  | 35.1689  | 36.5481  | 37.9273   | (42c)       |
| Average daily hot water use (litres/day)                                                       |          |          |          |          |          |          |          |          |          |          |          | 116.9539  | (43)        |
| Daily hot water use                                                                            | 127.2306 | 124.5141 | 121.2058 | 116.1748 | 112.0895 | 107.6973 | 106.0091 | 109.3031 | 112.7772 | 117.3882 | 122.4967 | 126.9006  | (44)        |
| Energy conte                                                                                   | 201.5022 | 177.3065 | 186.2889 | 159.0376 | 150.8940 | 132.4264 | 128.2088 | 135.3401 | 139.0655 | 159.2947 | 174.5191 | 198.6956  | (45)        |
| Energy content (annual)                                                                        |          |          |          |          |          |          |          |          |          |          |          | 1942.5793 |             |
| Distribution loss (46)m = $0.15 \times (45)\text{m}$                                           | 30.2253  | 26.5960  | 27.9433  | 23.8556  | 22.6341  | 19.8640  | 19.2313  | 20.3010  | 20.8598  | 23.8942  | 26.1779  | 29.8043   | (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                                | 250.7116 | 221.7537 | 235.4983 | 206.6596 | 200.1034 | 180.0484 | 177.4182 | 184.5495 | 186.6875 | 208.5041 | 222.1411 | 247.9050  | (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                                                                                | 250.7116 | 221.7537 | 235.4983 | 206.6596 | 200.1034 | 180.0484 | 177.4182 | 184.5495 | 186.6875 | 208.5041 | 222.1411 | 247.9050  | (64)        |
| 12Total per year (kWh/year)                                                                    |          |          |          |          |          |          |          |          |          |          |          | 2521.9803 | (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) = $\text{Sum}(64a)\text{m} =$ |          |          |          |          |          |          |          |          |          |          |          | 0.0000    | (64a)       |
| Heat gains from water heating, kWh/month                                                       | 106.3670 | 94.5122  | 101.3086 | 90.9776  | 89.5398  | 82.1294  | 81.9970  | 84.3681  | 84.3369  | 92.3330  | 96.1252  | 105.4338  | (65)        |

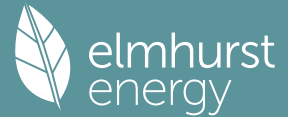
## 5. Internal gains (see Table 5 and 5a)

|                                                                                     |          |          |          |          |          |          |          |          |          |          |          |          |      |
|-------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| Metabolic gains (Table 5), Watts                                                    |          |          |          |          |          |          |          |          |          |          |          |          |      |
| (66)m                                                                               | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 100.9181 | 111.7307 | 100.9181 | 104.2820 | 100.9181 | 104.2820 | 100.9181 | 100.9181 | 104.2820 | 100.9181 | 104.2820 | 100.9181 | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 200.0814 | 202.1576 | 196.9256 | 185.7873 | 171.7272 | 158.5126 | 149.6845 | 147.6083 | 152.8403 | 163.9786 | 178.0387 | 191.2533 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | (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)                                 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | (71) |
| Water heating gains (Table 5)                                                       | 142.9664 | 140.6431 | 136.1674 | 126.3578 | 120.3492 | 114.0686 | 110.2110 | 113.3980 | 117.1346 | 124.1035 | 133.5072 | 141.7121 | (72) |
| Total internal gains                                                                | 501.0894 | 511.6550 | 491.1347 | 473.5506 | 450.1180 | 433.9868 | 417.9371 | 419.0479 | 431.3804 | 446.1237 | 472.9515 | 491.0070 | (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    |
|-------|------------------------|--------------------------------------------|-----------------------------------|------------------------------------|------------------------------|---------------|
| North | 6.5000                 | 10.6334                                    | 0.6300                            | 0.8000                             | 0.7700                       | 24.1406 (74)  |
| South | 6.5000                 | 46.7521                                    | 0.6300                            | 0.8000                             | 0.7700                       | 106.1397 (78) |

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|             |          |          |          |          |           |           |           |          |          |          |              |               |
|-------------|----------|----------|----------|----------|-----------|-----------|-----------|----------|----------|----------|--------------|---------------|
| North       | 6.5000   |          | 10.6334  |          | 0.6300    |           | 0.8000    |          | 0.7700   |          | 24.1406 (74) |               |
| Solar gains | 154.4210 | 266.0975 | 378.2139 | 502.1001 | 600.0375  | 614.1497  | 584.2877  | 507.1488 | 419.8152 | 297.3245 | 185.3730     | 131.9642 (83) |
| Total gains | 655.5104 | 777.7525 | 869.3486 | 975.6507 | 1050.1555 | 1048.1364 | 1002.2248 | 926.1968 | 851.1956 | 743.4482 | 658.3245     | 622.9712 (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                                                                         | 19.3988                   | 19.4577 | 19.5168 | 19.8181 | 19.8795 | 20.1922 | 20.1922 | 20.2559 | 20.0660 | 19.8795 | 19.7571 | 19.6362      |
| alpha                                                                       | 2.2933                    | 2.2972  | 2.3011  | 2.3212  | 2.3253  | 2.3461  | 2.3461  | 2.3504  | 2.3377  | 2.3253  | 2.3171  | 2.3091       |
| util living area                                                            | 0.8618                    | 0.8103  | 0.7452  | 0.6381  | 0.5113  | 0.3772  | 0.2816  | 0.3141  | 0.4761  | 0.6811  | 0.8134  | 0.8728 (86)  |
| Living                                                                      | 18.7169                   | 19.1365 | 19.6387 | 20.2217 | 20.6344 | 20.8732 | 20.9536 | 20.9391 | 20.7713 | 20.2276 | 19.4034 | 18.6505      |
| Non living                                                                  | 17.4392                   | 17.9576 | 18.5748 | 19.2822 | 19.7596 | 20.0273 | 20.1038 | 20.0949 | 19.9253 | 19.3088 | 18.3069 | 17.3627      |
| 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                                                                         | 19.8321                   | 19.1365 | 19.6387 | 20.2217 | 20.6344 | 20.8732 | 20.9536 | 20.9391 | 20.7713 | 20.2276 | 19.4034 | 18.9792 (87) |
| Th 2                                                                        | 20.1022                   | 20.1047 | 20.1072 | 20.1196 | 20.1220 | 20.1345 | 20.1345 | 20.1370 | 20.1295 | 20.1220 | 20.1171 | 20.1121 (88) |
| util rest of house                                                          | 0.8492                    | 0.7942  | 0.7242  | 0.6100  | 0.4750  | 0.3325  | 0.2297  | 0.2598  | 0.4284  | 0.6492  | 0.7951  | 0.8611 (89)  |
| MIT 2                                                                       | 19.0404                   | 17.9576 | 18.5748 | 19.2822 | 19.7596 | 20.0273 | 20.1038 | 20.0949 | 19.9253 | 19.3088 | 18.3069 | 17.8582 (90) |
| Living area fraction                                                        | FLA = Living area / (4) = |         |         |         |         |         |         |         |         |         |         |              |
| MIT                                                                         | 19.3995                   | 18.4924 | 19.0574 | 19.7084 | 20.1565 | 20.4111 | 20.4894 | 20.4779 | 20.3091 | 19.7256 | 18.8043 | 18.3667 (92) |
| Temperature adjustment                                                      | 0.0000                    |         |         |         |         |         |         |         |         |         |         |              |
| adjusted MIT                                                                | 19.3995                   | 18.4924 | 19.0574 | 19.7084 | 20.1565 | 20.4111 | 20.4894 | 20.4779 | 20.3091 | 19.7256 | 18.8043 | 18.3667 (93) |

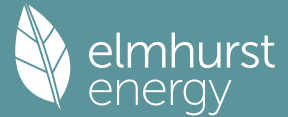
## 8. Space heating requirement

|                                                                                |                            |          |          |          |          |          |          |          |          |          |          |                |
|--------------------------------------------------------------------------------|----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------|
|                                                                                | Jan                        | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec            |
| Utilisation                                                                    | 0.8384                     | 0.7606   | 0.6968   | 0.5960   | 0.4765   | 0.3471   | 0.2513   | 0.2816   | 0.4386   | 0.6335   | 0.7631   | 0.8337 (94)    |
| Useful gains                                                                   | 549.5506                   | 591.5582 | 605.7356 | 581.5285 | 500.3895 | 363.7867 | 251.8116 | 260.8329 | 373.3151 | 470.9659 | 502.3908 | 519.3521 (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                                                               | 1050.7819                  | 943.0400 | 868.5931 | 736.2491 | 574.2587 | 388.5049 | 260.0272 | 271.7719 | 417.7277 | 619.6979 | 799.7376 | 973.9469 (97)  |
| Space heating kWh                                                              | 372.9161                   | 236.1957 | 195.5660 | 111.3988 | 54.9587  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 110.6567 | 214.0897 | 338.2185 (98a) |
| Space heating requirement - total per year (kWh/year)                          | 1634.0002                  |          |          |          |          |          |          |          |          |          |          |                |
| 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                                                              | 372.9161                   | 236.1957 | 195.5660 | 111.3988 | 54.9587  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 110.6567 | 214.0897 | 338.2185 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) | 1634.0002                  |          |          |          |          |          |          |          |          |          |          |                |
| Space heating per m2                                                           | (98c) / (4) = 22.9494 (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 %)                                                     |                |          |          |          |          |          |          |          |          |          |          | 232.3946 (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                                                                            | 372.9161       | 236.1957 | 195.5660 | 111.3988 | 54.9587  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 110.6567 | 214.0897 | 338.2185 (98)  |
| Space heating efficiency (main heating system 1)                                                     | 232.3946       | 232.3946 | 232.3946 | 232.3946 | 232.3946 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 232.3946 | 232.3946 | 232.3946 (210) |
| Space heating fuel (main heating system)                                                             | 160.4668       | 101.6357 | 84.1526  | 47.9352  | 23.6489  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 47.6159  | 92.1234  | 145.5363 (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                                                                            | 250.7116       | 221.7537 | 235.4983 | 206.6596 | 200.1034 | 180.0484 | 177.4182 | 184.5495 | 186.6875 | 208.5041 | 222.1411 | 247.9050 (64)  |
| Efficiency of water heater (217)m                                                                    | 321.8153       | 321.8153 | 321.8153 | 321.8153 | 321.8153 | 321.8153 | 321.8153 | 321.8153 | 321.8153 | 321.8153 | 321.8153 | 321.8153 (216) |
| Fuel for water heating, kWh/month                                                                    | 77.9054        | 68.9071  | 73.1781  | 64.2168  | 62.1796  | 55.9478  | 55.1305  | 57.3464  | 58.0108  | 64.7900  | 69.0275  | 77.0333 (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                                                                                         | 12.4495        | 11.2447  | 12.4495  | 12.0479  | 12.4495  | 12.0479  | 12.4495  | 12.4495  | 12.0479  | 12.4495  | 12.0479  | 12.4495 (231)  |
| Lighting                                                                                             | 20.1592        | 16.1725  | 14.5615  | 10.6684  | 8.2406   | 6.7326   | 7.5173   | 9.7713   | 12.6920  | 16.6525  | 18.8090  | 20.7195 (232)  |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        | 0.0000         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (233a)  |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                              | 0.0000         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (234a)  |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)                  | 0.0000         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235a)  |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) | 0.0000         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235c)  |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        | 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)                              | 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)                  | 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) | 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                                                                   | 703.1146 (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                                                                                    | 321.8153        |
| Water heating fuel used                                                                                       | 783.6733 (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)                                                                    | 146.5830 (230a) |
| Total electricity for the above, kWh/year                                                                     | 146.5830 (231)  |
| Electricity for lighting (calculated in Appendix L)                                                           | 162.6965 (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                                                                           | 1796.0674 (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                   | 703.1146           | 0.1556                        | 109.3783 (261)           |
| Total CO2 associated with community systems     |                    |                               | 0.0000 (373)             |
| Water heating (other fuel)                      | 783.6733           | 0.1409                        | 110.4350 (264)           |
| Space and water heating                         |                    |                               | 219.8134 (265)           |
| Pumps, fans and electric keep-hot               | 146.5830           | 0.1387                        | 20.3329 (267)            |
| Energy for lighting                             | 162.6965           | 0.1443                        | 23.4821 (268)            |
| Total CO2, kg/year                              |                    |                               | 263.6284 (272)           |
| EPC Dwelling Carbon Dioxide Emission Rate (DER) |                    |                               | 3.7000 (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               | 703.1146           | 1.5759                              | 1108.0140 (275)            |
| Total CO2 associated with community systems |                    |                                     | 0.0000 (473)               |
| Water heating (other fuel)                  | 783.6733           | 1.5211                              | 1192.0228 (278)            |
| Space and water heating                     |                    |                                     | 2300.0368 (279)            |
| Pumps, fans and electric keep-hot           | 146.5830           | 1.5128                              | 221.7508 (281)             |
| Energy for lighting                         | 162.6965           | 1.5338                              | 249.5493 (282)             |
| Total Primary energy kWh/year               |                    |                                     | 2771.3369 (286)            |
| Dwelling Primary energy Rate (DPER)         |                    |                                     | 38.9200 (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                                          | 71.2000 (1b) | x 2.5000 (2b)                   | = 178.0000 (1b) - (3b) |
| Ground floor                                           |              |                                 |                        |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 71.2000      |                                 | (4)                    |
| Dwelling volume                                        |              | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 178.0000 (5)         |

### 2. Ventilation rate

|                                                      | m3 per hour                                                                      |
|------------------------------------------------------|----------------------------------------------------------------------------------|
| Number of open chimneys                              | 0 * 80 = 0.0000 (6a)                                                             |
| Number of open flues                                 | 0 * 20 = 0.0000 (6b)                                                             |
| Number of chimneys / flues attached to closed fire   | 0 * 10 = 0.0000 (6c)                                                             |
| Number of flues attached to solid fuel boiler        | 0 * 20 = 0.0000 (6d)                                                             |
| Number of flues attached to other heater             | 0 * 35 = 0.0000 (6e)                                                             |
| Number of blocked chimneys                           | 0 * 20 = 0.0000 (6f)                                                             |
| Number of intermittent extract fans                  | 3 * 10 = 30.0000 (7a)                                                            |
| Number of passive vents                              | 0 * 10 = 0.0000 (7b)                                                             |
| Number of flueless gas fires                         | 0 * 40 = 0.0000 (7c)                                                             |
| Infiltration due to chimneys, flues and fans         | = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1685 (8) |
| Pressure test                                        | Yes                                                                              |
| Pressure Test Method                                 | Blower Door                                                                      |
| Measured/design AP50                                 | 5.0000 (17)                                                                      |
| Infiltration rate                                    | 0.4185 (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) = 0.3558 (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 | 0.4536 | 0.4447 | 0.4358 | 0.3913 | 0.3824 | 0.3380 | 0.3380 | 0.3291 | 0.3558 | 0.3824 | 0.4002 | 0.4180 (22b) |
| Effective ac    | 0.6029 | 0.5989 | 0.5950 | 0.5766 | 0.5731 | 0.5571 | 0.5571 | 0.5541 | 0.5633 | 0.5731 | 0.5801 | 0.5874 (25)  |

# Full SAP Calculation Printout



## 3. Heat losses and heat loss parameter

| Element                                                             | Gross<br>m2    | Openings<br>m2 | NetArea<br>m2  | U-value<br>W/m2K     | A x U<br>W/K   | K-value<br>kJ/m2K     | A x K<br>kJ/K  |                |                |                |                |                |      |
|---------------------------------------------------------------------|----------------|----------------|----------------|----------------------|----------------|-----------------------|----------------|----------------|----------------|----------------|----------------|----------------|------|
| Main dwelling                                                       |                |                |                |                      |                |                       |                |                |                |                |                |                |      |
| TER Opaque door                                                     |                |                | 2.1000         | 1.0000               | 2.1000         |                       |                | (26)           |                |                |                |                |      |
| TER Opening Type                                                    |                |                | 15.6900        | 1.1450               | 17.9656        |                       |                | (27)           |                |                |                |                |      |
| top floor exposed new                                               | 58.7500        | 15.6900        | 43.0600        | 0.1800               | 7.7508         |                       |                | (29a)          |                |                |                |                |      |
| corridor new                                                        | 9.7500         | 2.1000         | 7.6500         | 0.1800               | 1.3770         |                       |                | (29a)          |                |                |                |                |      |
| flat roof new                                                       | 39.1000        |                | 39.1000        | 0.1100               | 4.3010         |                       |                | (30)           |                |                |                |                |      |
| roof terrace new                                                    | 32.1000        |                | 32.1000        | 0.1100               | 3.5310         |                       |                | (30)           |                |                |                |                |      |
| Total net area of external elements Aum(A, m2)                      |                |                | 139.7000       |                      |                |                       |                | (31)           |                |                |                |                |      |
| Fabric heat loss, W/K = Sum (A x U)                                 |                |                |                | (26)...(30) + (32) = | 37.0254        |                       |                | (33)           |                |                |                |                |      |
| Main dwelling                                                       |                |                |                |                      |                |                       |                |                |                |                |                |                |      |
| pw                                                                  |                |                | 16.0000        | 0.0000               | 0.0000         |                       |                | (32)           |                |                |                |                |      |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                   |                |                |                |                      |                |                       | 68.2570        | (35)           |                |                |                |                |      |
| List of Thermal Bridges                                             |                |                |                |                      |                |                       |                |                |                |                |                |                |      |
| K1 Element                                                          |                |                |                | Length               | Psi-value      |                       | Total          |                |                |                |                |                |      |
| E2 Other lintels (including other steel lintels)                    |                |                |                | 8.8000               | 0.0500         |                       | 0.4400         |                |                |                |                |                |      |
| E3 Sill                                                             |                |                |                | 7.8000               | 0.0500         |                       | 0.3900         |                |                |                |                |                |      |
| E4 Jamb                                                             |                |                |                | 19.2000              | 0.0500         |                       | 0.9600         |                |                |                |                |                |      |
| E7 Party floor between dwellings (in blocks of flats)               |                |                |                | 0.0000               | 0.0700         |                       | 0.0000         |                |                |                |                |                |      |
| E15 Flat roof with parapet                                          |                |                |                | 24.0000              | 0.5600         |                       | 13.4400        |                |                |                |                |                |      |
| E16 Corner (normal)                                                 |                |                |                | 5.0000               | 0.0900         |                       | 0.4500         |                |                |                |                |                |      |
| E17 Corner (inverted - internal area greater than external area)    |                |                |                | 0.0000               | -0.0900        |                       | -0.0000        |                |                |                |                |                |      |
| E18 Party wall between dwellings                                    |                |                |                | 5.0000               | 0.0600         |                       | 0.3000         |                |                |                |                |                |      |
| E24 Eaves (insulation at ceiling level - inverted)                  |                |                |                | 24.0000              | 0.2400         |                       | 5.7600         |                |                |                |                |                |      |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)          |                |                |                |                      |                |                       | 21.7400        | (36)           |                |                |                |                |      |
| Point Thermal bridges                                               |                |                |                |                      |                |                       | 0.0000         |                |                |                |                |                |      |
| Total fabric heat loss                                              |                |                |                |                      |                | (33) + (36) + (36a) = | 58.7654        | (37)           |                |                |                |                |      |
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) |                |                |                |                      |                |                       |                |                |                |                |                |                |      |
| (38)m                                                               | Jan<br>35.4127 | Feb<br>35.1781 | Mar<br>34.9481 | Apr<br>33.8678       | May<br>33.6657 | Jun<br>32.7248        | Jul<br>32.7248 | Aug<br>32.5505 | Sep<br>33.0872 | Oct<br>33.6657 | Nov<br>34.0746 | Dec<br>34.5020 | (38) |
| Heat transfer coeff                                                 | 94.1782        | 93.9436        | 93.7136        | 92.6332              | 92.4311        | 91.4902               | 91.4902        | 91.3160        | 91.8526        | 92.4311        | 92.8400        | 93.2675        | (39) |
| Average = Sum(39)m / 12 =                                           |                |                |                |                      |                |                       |                |                |                |                |                | 92.6323        |      |
| HLP                                                                 | Jan<br>1.3227  | Feb<br>1.3194  | Mar<br>1.3162  | Apr<br>1.3010        | May<br>1.2982  | Jun<br>1.2850         | Jul<br>1.2850  | Aug<br>1.2825  | Sep<br>1.2901  | Oct<br>1.2982  | Nov<br>1.3039  | Dec<br>1.3099  | (40) |
| HLP (average)                                                       |                |                |                |                      |                |                       |                |                |                |                |                | 1.3010         |      |
| Days in month                                                       | 31             | 28             | 31             | 30                   | 31             | 30                    | 31             | 31             | 30             | 31             | 30             | 31             |      |

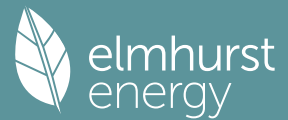
## 4. Water heating energy requirements (kWh/year)

|                                                                 |          |          |          |          |          |          |          |          |          |                                        |          |           |          |       |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------------------------------|----------|-----------|----------|-------|
| Assumed occupancy                                               |          |          |          |          |          |          |          |          |          |                                        |          |           | 2.2749   | (42)  |
| Hot water usage for mixer showers                               | 62.3623  | 61.4251  | 60.0594  | 57.4465  | 55.5182  | 53.3678  | 52.1455  | 53.5008  | 54.9865  | 57.2954                                | 59.9645  | 62.1233   | (42a)    |       |
| Hot water usage for baths                                       | 26.9410  | 26.5409  | 25.9775  | 24.9386  | 24.1607  | 23.2981  | 22.8322  | 23.3917  | 24.0009  | 24.9239                                | 25.9842  | 26.8500   | (42b)    |       |
| Hot water usage for other uses                                  | 37.9273  | 36.5481  | 35.1689  | 33.7897  | 32.4106  | 31.0314  | 31.0314  | 32.4106  | 33.7897  | 35.1689                                | 36.5481  | 37.9273   | (42c)    |       |
| Average daily hot water use (litres/day)                        |          |          |          |          |          |          |          |          |          |                                        |          |           | 116.9539 | (43)  |
|                                                                 | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct                                    | Nov      | Dec       |          |       |
| Daily hot water use                                             | 127.2306 | 124.5141 | 121.2058 | 116.1748 | 112.0895 | 107.6973 | 106.0091 | 109.3031 | 112.7772 | 117.3882                               | 122.4967 | 126.9006  | (44)     |       |
| Energy content (annual)                                         | 201.5022 | 177.3065 | 186.2889 | 159.0376 | 150.8940 | 132.4264 | 128.2088 | 135.3401 | 139.0655 | 159.2947                               | 174.5191 | 198.6956  | (45)     |       |
| Distribution loss (46)m = 0.15 x (45)m                          | 30.2253  | 26.5960  | 27.9433  | 23.8556  | 22.6341  | 19.8640  | 19.2313  | 20.3010  | 20.8598  | 23.8942                                | 26.1779  | 29.8043   | (46)     |       |
| Water storage loss:                                             |          |          |          |          |          |          |          |          |          |                                        |          |           |          |       |
| Store volume                                                    |          |          |          |          |          |          |          |          |          |                                        |          |           | 150.0000 | (47)  |
| a) If manufacturer declared loss factor is known (kWh/day):     |          |          |          |          |          |          |          |          |          |                                        |          |           | 1.3938   | (48)  |
| Temperature factor from Table 2b                                |          |          |          |          |          |          |          |          |          |                                        |          |           | 0.5400   | (49)  |
| Enter (49) or (54) in (55)                                      |          |          |          |          |          |          |          |          |          |                                        |          |           | 0.7527   | (55)  |
| Total storage loss                                              | 23.3325  | 21.0745  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | 23.3325  | 22.5798  | 23.3325                                | 22.5798  | 23.3325   | (56)     |       |
| If cylinder contains dedicated solar storage                    | 23.3325  | 21.0745  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | 23.3325  | 22.5798  | 23.3325                                | 22.5798  | 23.3325   | (57)     |       |
| Primary loss                                                    | 23.2624  | 21.0112  | 23.2624  | 22.5120  | 23.2624  | 22.5120  | 23.2624  | 23.2624  | 22.5120  | 23.2624                                | 22.5120  | 23.2624   | (59)     |       |
| Combi loss                                                      | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                 | 0.0000   | 0.0000    | (61)     |       |
| Total heat required for water heating calculated for each month | 248.0971 | 219.3922 | 232.8838 | 204.1294 | 197.4889 | 177.5183 | 174.8037 | 181.9350 | 184.1574 | 205.8896                               | 219.6109 | 245.2905  | (62)     |       |
| WWHRS                                                           | -28.5094 | -25.2140 | -26.4026 | -21.8624 | -20.3750 | -17.4350 | -16.3426 | -17.3787 | -18.0389 | -21.2659                               | -24.0917 | -27.9815  | (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                                                 | 219.5876 | 194.1782 | 206.4812 | 182.2670 | 177.1139 | 160.0832 | 158.4612 | 164.5563 | 166.1184 | 184.6237                               | 195.5192 | 217.3091  | (64)     |       |
| 12Total per year (kWh/year)                                     |          |          |          |          |          |          |          |          |          | Total per year (kWh/year) = Sum(64)m = |          | 2226.2990 | (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)    |       |
|                                                                 |          |          |          |          |          |          |          |          |          |                                        |          |           | 0.0000   | (64a) |
| Heat gains from water heating, kWh/month                        | 104.2754 | 92.6230  | 99.2170  | 88.9535  | 87.4482  | 80.1053  | 79.9054  | 82.2765  | 82.3128  | 90.2414                                | 94.1011  | 103.3422  | (65)     |       |

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

|                                                                                     |          |          |          |          |          |          |          |          |          |          |          |          |      |
|-------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|
| Metabolic gains (Table 5), Watts                                                    |          |          |          |          |          |          |          |          |          |          |          |          |      |
| (66)m                                                                               | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | 113.7451 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 100.9476 | 111.7635 | 100.9476 | 104.3126 | 100.9476 | 104.3126 | 100.9476 | 100.9476 | 104.3126 | 100.9476 | 104.3126 | 100.9476 | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 200.0814 | 202.1576 | 196.9256 | 185.7873 | 171.7272 | 158.5126 | 149.6845 | 147.6083 | 152.8403 | 163.9786 | 178.0387 | 191.2533 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | 34.3745  | (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) | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 | -90.9961 (71) |
| Water heating gains (Table 5)                       | 140.1551 | 137.8318 | 133.3561 | 123.5465 | 117.5379 | 111.2573 | 107.3997 | 110.5867 | 114.3233 | 121.2922 | 130.6959 | 138.9008 (72) |
| Total internal gains                                | 501.3077 | 511.8764 | 491.3529 | 473.7699 | 450.3362 | 431.2060 | 415.1554 | 416.2662 | 428.5997 | 446.3420 | 473.1708 | 491.2253 (73) |

## 6. Solar gains

| [Jan]       |          |          |          | Area<br>m2 | Solar flux<br>Table 6a<br>W/m2 | g<br>Specific data<br>or Table 6b | FF<br>Specific data<br>or Table 6c | Access<br>factor<br>Table 6d | Gains<br>W   |          |          |               |
|-------------|----------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|--------------|----------|----------|---------------|
| North       |          |          |          | 10.4600    | 10.6334                        | 0.6300                            | 0.7000                             | 0.7700                       | 33.9919 (74) |          |          |               |
| South       |          |          |          | 5.2300     | 46.7521                        | 0.6300                            | 0.7000                             | 0.7700                       | 74.7264 (78) |          |          |               |
| <hr/>       |          |          |          |            |                                |                                   |                                    |                              |              |          |          |               |
| Solar gains | 108.7183 | 187.3429 | 266.2771 | 353.4978   | 422.4495                       | 432.3850                          | 411.3610                           | 357.0523                     | 295.5660     | 209.3279 | 130.5097 | 92.9078 (83)  |
| Total gains | 610.0260 | 699.2193 | 757.6301 | 827.2676   | 872.7857                       | 863.5910                          | 826.5164                           | 773.3185                     | 724.1657     | 655.6699 | 603.6805 | 584.1331 (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                                                                         | 14.3342 | 14.3700 | 14.4053 | 14.5733 | 14.6052 | 14.7554 | 14.7554 | 14.7835 | 14.6972 | 14.6052 | 14.5408 | 14.4742      |
| alpha                                                                       | 1.9556  | 1.9580  | 1.9604  | 1.9716  | 1.9737  | 1.9837  | 1.9837  | 1.9856  | 1.9798  | 1.9737  | 1.9694  | 1.9649       |
| util living area                                                            | 0.8977  | 0.8678  | 0.8289  | 0.7579  | 0.6587  | 0.5309  | 0.4191  | 0.4551  | 0.6193  | 0.7801  | 0.8668  | 0.9047 (86)  |
| MIT                                                                         | 17.6261 | 18.0151 | 18.5880 | 19.3597 | 20.0532 | 20.5751 | 20.8123 | 20.7719 | 20.3817 | 19.5044 | 18.4551 | 17.5639 (87) |
| Th 2                                                                        | 19.8231 | 19.8256 | 19.8282 | 19.8400 | 19.8423 | 19.8526 | 19.8526 | 19.8545 | 19.8486 | 19.8423 | 19.8378 | 19.8331 (88) |
| util rest of house                                                          | 0.8859  | 0.8528  | 0.8088  | 0.7282  | 0.6135  | 0.4631  | 0.3282  | 0.3642  | 0.5559  | 0.7468  | 0.8493  | 0.8936 (89)  |
| MIT 2                                                                       | 15.9840 | 16.4633 | 17.1694 | 18.1102 | 18.9273 | 19.5105 | 19.7409 | 19.7110 | 19.3178 | 18.3057 | 17.0224 | 15.9099 (90) |
| Living area fraction                                                        | 16.7290 | 17.1673 | 17.8130 | 18.6770 | 19.4381 | 19.9935 | 20.2269 | 20.1923 | 19.8004 | 18.8495 | 17.6724 | 16.6602 (92) |
| MIT                                                                         | 16.7290 | 17.1673 | 17.8130 | 18.6770 | 19.4381 | 19.9935 | 20.2269 | 20.1923 | 19.8004 | 18.8495 | 17.6724 | 16.6602 (93) |
| Temperature adjustment                                                      |         |         |         |         |         |         |         |         |         |         |         | 0.0000       |
| adjusted MIT                                                                | 16.7290 | 17.1673 | 17.8130 | 18.6770 | 19.4381 | 19.9935 | 20.2269 | 20.1923 | 19.8004 | 18.8495 | 17.6724 | 16.6602 (93) |

## 8. Space heating requirement

|                                                                                |           |           |           |          |          |          |          |          |          |               |          |                |
|--------------------------------------------------------------------------------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|---------------|----------|----------------|
| Utilisation                                                                    | 0.8433    | 0.8085    | 0.7656    | 0.6930   | 0.5960   | 0.4720   | 0.3594   | 0.3926   | 0.5529   | 0.7124        | 0.8065   | 0.8520 (94)    |
| Useful gains                                                                   | 514.4334  | 565.2995  | 580.0615  | 573.3261 | 520.1499 | 407.6030 | 297.0531 | 303.6283 | 400.4238 | 467.1027      | 486.8722 | 497.6977 (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                                                               | 1170.5375 | 1152.4298 | 1060.1813 | 905.6762 | 715.2385 | 493.4489 | 331.8301 | 346.2983 | 523.6007 | 762.5095      | 981.5384 | 1162.1347 (97) |
| Space heating kWh                                                              | 488.1414  | 394.5516  | 357.2091  | 239.2921 | 145.1459 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 219.7826      | 356.1596 | 494.3412 (98a) |
| Space heating requirement - total per year (kWh/year)                          |           |           |           |          |          |          |          |          |          |               |          | 2694.6237      |
| 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                                                              | 488.1414  | 394.5516  | 357.2091  | 239.2921 | 145.1459 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 219.7826      | 356.1596 | 494.3412 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) |           |           |           |          |          |          |          |          |          |               |          | 2694.6237      |
| Space heating per m <sup>2</sup>                                               |           |           |           |          |          |          |          |          |          | (98c) / (4) = |          | 37.8458 (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                                                                   | 488.1414 | 394.5516 | 357.2091 | 239.2921  | 145.1459  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 219.7826 | 356.1596 | 494.3412 (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)                                                    | 528.8640 | 427.4665 | 387.0088 | 259.2548  | 157.2545  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 238.1177 | 385.8718 | 535.5809 (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                                                                   | 219.5876 | 194.1782 | 206.4812 | 182.2670  | 177.1139  | 160.0832 | 158.4612 | 164.5563 | 166.1184 | 184.6237 | 195.5192 | 217.3091 (64)   |
| Efficiency of water heater (217)m                                                           | 85.7977  | 85.6153  | 85.2770  | 84.6712   | 83.6170   | 79.8000  | 79.8000  | 79.8000  | 79.8000  | 84.4517  | 85.3870  | 79.8000 (216)   |
| Fuel for water heating, kWh/month                                                           | 255.9365 | 226.8033 | 242.1299 | 215.2645  | 211.8156  | 200.6056 | 198.5729 | 206.2109 | 208.1684 | 218.6145 | 228.9800 | 253.1452 (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                                                                                    | 20.9749  | 16.8269  | 15.1507  | 11.1001   | 8.5740    | 7.0050   | 7.8215   | 10.1667  | 13.2055  | 17.3264  | 19.5701  | 21.5579 (232)   |
| Electricity generated by PVs (Appendix M) (negative quantity) (233a)m                       | -55.2723 | -72.7966 | -97.8683 | -102.7451 | -105.0771 | -96.1554 | -94.9603 | -92.3248 | -87.0169 | -79.5887 | -58.9118 | -48.4136 (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)   |

# Full SAP Calculation Printout



|                                                                                                      |          |           |           |           |           |           |           |           |           |           |          |          |            |        |
|------------------------------------------------------------------------------------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|----------|------------|--------|
| 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                                                                                              | -48.9785 | -100.2938 | -194.5067 | -285.4394 | -371.2042 | -370.7266 | -366.3365 | -312.9300 | -233.1399 | -141.0371 | -64.5743 | -38.9402 | (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                                                                   |          |           |           |           |           |           |           |           |           |           |          |          | 2919.4189  | (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                                                                              |          |           |           |           |           |           |           |           |           |           |          |          | 2666.2474  | (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)                                                  |          |           |           |           |           |           |           |           |           |           |          |          | 169.2797   | (232)  |
| Energy saving/generation technologies (Appendices M ,N and Q)                                        |          |           |           |           |           |           |           |           |           |           |          |          |            |        |
| PV generation                                                                                        |          |           |           |           |           |           |           |           |           |           |          |          | -3519.2382 | (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                                                                  |          |           |           |           |           |           |           |           |           |           |          |          | 2321.7078  | (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                 | 2919.4189          | 0.2100                        | 613.0780                 | (261) |
| Total CO2 associated with community systems   |                    |                               | 0.0000                   | (373) |
| Water heating (other fuel)                    | 2666.2474          | 0.2100                        | 559.9120                 | (264) |
| Space and water heating                       |                    |                               | 1172.9899                | (265) |
| Pumps, fans and electric keep-hot             | 86.0000            | 0.1387                        | 11.9293                  | (267) |
| Energy for lighting                           | 169.2797           | 0.1443                        | 24.4323                  | (268) |
| Energy saving/generation technologies         |                    |                               |                          |       |
| PV Unit electricity used in dwelling          | -991.1310          | 0.1360                        | -134.8403                |       |
| PV Unit electricity exported                  | -2528.1072         | 0.1266                        | -320.0471                |       |
| Total                                         |                    |                               | -454.8874                | (269) |
| Total CO2, kg/year                            |                    |                               | 754.4641                 | (272) |
| EPC Target Carbon Dioxide Emission Rate (TER) |                    |                               | 10.6000                  | (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               | 2919.4189          | 1.1300                              | 3298.9434                  | (275) |
| Total CO2 associated with community systems |                    |                                     | 0.0000                     | (473) |
| Water heating (other fuel)                  | 2666.2474          | 1.1300                              | 3012.8596                  | (278) |
| Space and water heating                     |                    |                                     | 6311.8030                  | (279) |
| Pumps, fans and electric keep-hot           | 86.0000            | 1.5128                              | 130.1008                   | (281) |
| Energy for lighting                         | 169.2797           | 1.5338                              | 259.6468                   | (282) |
| Energy saving/generation technologies       |                    |                                     |                            |       |
| PV Unit electricity used in dwelling        | -991.1310          | 1.5029                              | -1489.5563                 |       |
| PV Unit electricity exported                | -2528.1072         | 0.4647                              | -1174.8717                 |       |
| Total                                       |                    |                                     | -2664.4280                 | (283) |
| Total Primary energy kWh/year               |                    |                                     | 4037.1226                  | (286) |
| Target Primary Energy Rate (TPER)           |                    |                                     | 56.7000                    | (287) |