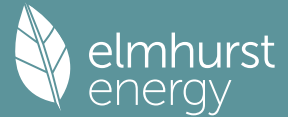


# Full SAP Calculation Printout



|                                    |                                                            |               |       |               |                |            |  |
|------------------------------------|------------------------------------------------------------|---------------|-------|---------------|----------------|------------|--|
| Property Reference                 | UNIT 40                                                    |               |       |               | Issued on Date | 02/07/2025 |  |
| Assessment Reference               | UNIT 40                                                    |               |       | Prop Type Ref |                |            |  |
| Property                           | Flat 41, Alexander House, 205 Kings Road, READING, RG1 4FW |               |       |               |                |            |  |
|                                    |                                                            |               |       |               |                |            |  |
| SAP Rating                         | 85 B                                                       | DER           | 3.86  | TER           | 10.10          |            |  |
| Environmental                      | 97 A                                                       | % DER < TER   |       |               |                | 61.78      |  |
| CO <sub>2</sub> Emissions (t/year) | 0.24                                                       | DFEE          | 41.30 | TFEE          | 41.87          |            |  |
| Compliance Check                   | See BREL                                                   | % DFEE < TFEE |       |               |                | 1.36       |  |
| % DPER < TPER                      | 24.96                                                      | DPER          | 40.53 | TPER          | 54.01          |            |  |
|                                    |                                                            |               |       |               |                |            |  |
| 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                                          | 67.8000 (1b)              | 2.5000 (2b)                     | 169.5000 (1b) - (3b)        |
| Ground floor                                           |                           |                                 |                             |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 67.8000                   |                                 |                             |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 169.5000 (5)                |

## 2. Ventilation rate

|                                                                                                  | m <sup>3</sup> per hour                 |
|--------------------------------------------------------------------------------------------------|-----------------------------------------|
| Number of open chimneys                                                                          | 0 * 80 = 0.0000 (6a)                    |
| Number of open flues                                                                             | 0 * 20 = 0.0000 (6b)                    |
| Number of chimneys / flues attached to closed fire                                               | 0 * 10 = 0.0000 (6c)                    |
| Number of flues attached to solid fuel boiler                                                    | 0 * 20 = 0.0000 (6d)                    |
| Number of flues attached to other heater                                                         | 0 * 35 = 0.0000 (6e)                    |
| Number of blocked chimneys                                                                       | 0 * 20 = 0.0000 (6f)                    |
| Number of intermittent extract fans                                                              | 0 * 10 = 0.0000 (7a)                    |
| Number of passive vents                                                                          | 0 * 10 = 0.0000 (7b)                    |
| Number of flueless gas fires                                                                     | 0 * 40 = 0.0000 (7c)                    |
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) | 0.0000 / (5) = 0.0000 (8)               |
| Pressure test                                                                                    | Yes                                     |
| Pressure Test Method                                                                             | Blower Door                             |
| Measured/design AP50                                                                             | 3.1300 (17)                             |
| Infiltration rate                                                                                | 0.1565 (18)                             |
| Number of sides sheltered                                                                        | 3 (19)                                  |
| Shelter factor                                                                                   | (20) = 1 - [0.075 x (19)] = 0.7750 (20) |
| Infiltration rate adjusted to include shelter factor                                             | (21) = (18) x (20) = 0.1213 (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                                                                                         | 0.1546 | 0.1516 | 0.1486 | 0.1334 | 0.1304 | 0.1152 | 0.1152 | 0.1122 | 0.1213 | 0.1304 | 0.1364 | 0.1425 (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                                                                                            | 0.2586 | 0.2556 | 0.2526 | 0.2374 | 0.2344 | 0.2192 | 0.2192 | 0.2162 | 0.2253 | 0.2344 | 0.2404 | 0.2465 (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                                       | 33.0000                 | 19.5000                    | 13.5000                   | 0.2000                        | 2.7000       | 18.0000                        | 243.0000 (29a)  |
| corridor new                                                | 52.5000                 | 2.1000                     | 50.4000                   | 0.2300                        | 11.5920      | 14.0000                        | 705.6000 (29a)  |
| flat roof new                                               | 31.3000                 |                            | 31.3000                   | 0.1300                        | 4.0690       | 9.0000                         | 281.7000 (30)   |
| roof terrace new                                            | 36.5000                 |                            | 36.5000                   | 0.1300                        | 4.7450       | 9.0000                         | 328.5000 (30)   |
| Total net area of external elements Aum(A, m <sup>2</sup> ) |                         |                            | 153.3000                  |                               |              |                                | (31)            |
| Fabric heat loss, W/K = Sum (A x U)                         |                         |                            |                           | (26)...(30) + (32) =          | 47.5342      |                                | (33)            |
| Main dwelling                                               |                         |                            |                           |                               |              |                                |                 |
| pw                                                          |                         |                            | 10.7500                   | 0.0000                        | 0.0000       | 20.0000                        | 215.0000 (32)   |
| pf                                                          |                         |                            | 67.8000                   |                               |              | 30.0000                        | 2034.0000 (32d) |
| iw                                                          |                         |                            | 88.0000                   |                               |              | 9.0000                         | 792.0000 (32c)  |

# Full SAP Calculation Printout



Heat capacity  $C_m = \text{Sum}(A \times k)$  (28)...(30) + (32) + (32a)...(32e) = 4599.8000 (34)  
Thermal mass parameter (TMP =  $C_m / \text{TFA}$ ) in kJ/m<sup>2</sup>K 67.8437 (35)

| List of Thermal Bridges                                          |         |           |        |
|------------------------------------------------------------------|---------|-----------|--------|
| K1 Element                                                       | Length  | Psi-value | Total  |
| E2 Other lintels (including other steel lintels)                 | 8.8000  | 0.0470    | 0.4136 |
| E3 Sill                                                          | 7.8000  | 0.0150    | 0.1170 |
| E4 Jamb                                                          | 19.2000 | 0.0470    | 0.9024 |
| E15 Flat roof with parapet                                       | 13.3000 | 0.1970    | 2.6201 |
| E17 Corner (inverted - internal area greater than external area) | 2.5000  | 0.0000    | 0.0000 |
| E18 Party wall between dwellings                                 | 5.0000  | 0.2400    | 1.2000 |
| E24 Eaves (insulation at ceiling level - inverted)               | 13.3000 | 0.0500    | 0.6650 |

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9181 (36)  
Point Thermal Bridges (36a) = 0.0000  
Total fabric heat loss (33) + (36) + (36a) = 53.4523 (37)

| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) |         |         |         |         |         |         |         |         |         |         |         |              |
|---------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| (38)m                                                               | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec          |
| Heat transfer coeff                                                 | 14.4671 | 14.2975 | 14.1279 | 13.2799 | 13.1103 | 12.2622 | 12.2622 | 12.0926 | 12.6015 | 13.1103 | 13.4495 | 13.7887 (38) |
| Average = Sum(39)m / 12 =                                           | 67.9195 | 67.7499 | 67.5802 | 66.7322 | 66.5626 | 65.7146 | 65.7146 | 65.5450 | 66.0538 | 66.5626 | 66.9018 | 67.2410 (39) |

|               | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec         |
|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------------|
| HLP           | 1.0018 | 0.9993 | 0.9968 | 0.9843 | 0.9817 | 0.9692 | 0.9692 | 0.9667 | 0.9742 | 0.9817 | 0.9868 | 0.9918 (40) |
| HLP (average) |        |        |        |        |        |        |        |        |        |        |        | 0.9836      |
| Days in mont  | 31     | 28     | 31     | 30     | 31     | 30     | 31     | 31     | 30     | 31     | 30     | 31          |

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

|                                                                 |             |          |          |          |          |          |          |          |          |                                        |          |                |
|-----------------------------------------------------------------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------------------------------------|----------|----------------|
| Assumed occupancy                                               | 2.1916 (42) |          |          |          |          |          |          |          |          |                                        |          |                |
| Hot water usage for mixer showers                               | 60.9647     | 60.0486  | 58.7135  | 56.1591  | 54.2740  | 52.1718  | 50.9769  | 52.3019  | 53.7543  | 56.0114                                | 58.6207  | 60.7312 (42a)  |
| Hot water usage for baths                                       | 26.3401     | 25.9489  | 25.3980  | 24.3823  | 23.6217  | 22.7784  | 22.3229  | 22.8699  | 23.4655  | 24.3679                                | 25.4045  | 26.2510 (42b)  |
| Hot water usage for other uses                                  | 37.0737     | 35.7255  | 34.3774  | 33.0293  | 31.6811  | 30.3330  | 30.3330  | 31.6811  | 33.0293  | 34.3774                                | 35.7255  | 37.0737 (42c)  |
| Average daily hot water use (litres/day)                        |             |          |          |          |          |          |          |          |          |                                        |          | 114.3322 (43)  |
| Daily hot water use                                             | 124.3785    | 121.7230 | 118.4889 | 113.5707 | 109.5769 | 105.2832 | 103.6328 | 106.8529 | 110.2490 | 114.7567                               | 119.7507 | 124.0559 (44)  |
| Energy conte                                                    | 196.9851    | 173.3319 | 182.1131 | 155.4726 | 147.5116 | 129.4580 | 125.3349 | 132.3062 | 135.9481 | 155.7238                               | 170.6069 | 194.2415 (45)  |
| Energy content (annual)                                         |             |          |          |          |          |          |          |          |          | Total = Sum(45)m =                     |          | 1899.0337      |
| Distribution loss (46)m = 0.15 x (45)m                          | 29.5478     | 25.9998  | 27.3170  | 23.3209  | 22.1267  | 19.4187  | 18.8002  | 19.8459  | 20.3922  | 23.3586                                | 25.5910  | 29.1362 (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 | 246.1945    | 217.7791 | 231.3225 | 203.0946 | 196.7210 | 177.0800 | 174.5443 | 181.5156 | 183.5701 | 204.9332                               | 218.2289 | 243.4509 (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                                                 | 246.1945    | 217.7791 | 231.3225 | 203.0946 | 196.7210 | 177.0800 | 174.5443 | 181.5156 | 183.5701 | 204.9332                               | 218.2289 | 243.4509 (64)  |
| 12Total per year (kWh/year)                                     |             |          |          |          |          |          |          |          |          | Total per year (kWh/year) = Sum(64)m = |          | 2478.4347 (64) |
| Electric shower(s)                                              | 0.0000      | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                 | 0.0000   | 0.0000 (64a)   |
| Heat gains from water heating, kWh/month                        | 104.8651    | 93.1906  | 99.9201  | 89.7922  | 88.4151  | 81.1424  | 81.0414  | 83.3593  | 83.3003  | 91.1457                                | 94.8244  | 103.9528 (65)  |

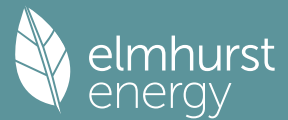
## 5. Internal gains (see Table 5 and 5a)

|                                                                                     |          |          |          |          |          |          |          |          |          |          |          |               |
|-------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| Metabolic gains (Table 5), Watts                                                    | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec           |
| (66)m                                                                               | 109.5776 | 109.5776 | 109.5776 | 109.5776 | 109.5776 | 109.5776 | 109.5776 | 109.5776 | 109.5776 | 109.5776 | 109.5776 | 109.5776 (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 96.8969  | 107.2787 | 96.8969  | 100.1268 | 96.8969  | 100.1268 | 96.8969  | 96.8969  | 100.1268 | 96.8969  | 100.1268 | 96.8969 (67)  |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 192.1089 | 194.1024 | 189.0789 | 178.3844 | 164.8845 | 152.1965 | 143.7201 | 141.7267 | 146.7502 | 157.4447 | 170.9446 | 183.6326 (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 33.9578  | 33.9578  | 33.9578  | 33.9578  | 33.9578  | 33.9578  | 33.9578  | 33.9578  | 33.9578  | 33.9578  | 33.9578  | 33.9578 (69)  |
| Pumps, fans                                                                         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (70)   |
| Losses e.g. evaporation (negative values) (Table 5)                                 | -87.6621 | -87.6621 | -87.6621 | -87.6621 | -87.6621 | -87.6621 | -87.6621 | -87.6621 | -87.6621 | -87.6621 | -87.6621 | -87.6621 (71) |
| Water heating gains (Table 5)                                                       | 140.9477 | 138.6765 | 134.3012 | 124.7114 | 118.8375 | 112.6978 | 108.9266 | 112.0421 | 115.6949 | 122.5076 | 131.7005 | 139.7215 (72) |
| Total internal gains                                                                | 485.8267 | 495.9309 | 476.1502 | 459.0959 | 436.4922 | 420.8943 | 405.4169 | 406.5389 | 418.4452 | 432.7225 | 458.6452 | 476.1242 (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) |
| East  | 6.5000                 | 19.6403                                    | 0.6300                            | 0.8000                             | 0.7700                       | 44.5887 (76) |
| East  | 6.5000                 | 19.6403                                    | 0.6300                            | 0.8000                             | 0.7700                       | 44.5887 (76) |

# Full SAP Calculation Printout



|             |          |          |          |           |           |           |           |          |          |          |          |               |
|-------------|----------|----------|----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|---------------|
| Solar gains | 113.3180 | 220.5838 | 365.6869 | 544.9203  | 683.1262  | 707.2485  | 669.9858  | 564.3842 | 428.3885 | 261.9159 | 140.9742 | 93.4599 (83)  |
| Total gains | 599.1447 | 716.5147 | 841.8371 | 1004.0161 | 1119.6184 | 1128.1428 | 1075.4027 | 970.9231 | 846.8336 | 694.6383 | 599.6194 | 569.5842 (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                                                                         | 18.8123 | 18.8594 | 18.9067 | 19.1470 | 19.1958 | 19.4435 | 19.4435 | 19.4938 | 19.3437                   | 19.1958 | 19.0985 | 19.0021      |             |
| alpha                                                                       | 2.2542  | 2.2573  | 2.2604  | 2.2765  | 2.2797  | 2.2962  | 2.2962  | 2.2996  | 2.2896                    | 2.2797  | 2.2732  | 2.2668       |             |
| util living area                                                            | 0.8720  | 0.8218  | 0.7440  | 0.6163  | 0.4782  | 0.3476  | 0.2591  | 0.2957  | 0.4690                    | 0.6939  | 0.8281  | 0.8825 (86)  |             |
| Living                                                                      | 18.5635 | 18.9986 | 19.5887 | 20.2425 | 20.6637 | 20.8849 | 20.9576 | 20.9416 | 20.7637                   | 20.1549 | 19.2621 | 18.4913      |             |
| Non living                                                                  | 17.2391 | 17.7774 | 18.5006 | 19.2864 | 19.7684 | 20.0130 | 20.0815 | 20.0715 | 19.8954                   | 19.2089 | 18.1222 | 17.1539      |             |
| 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                                                                         | 19.7536 | 18.9986 | 19.5887 | 20.2425 | 20.6637 | 20.8849 | 20.9576 | 20.9416 | 20.7637                   | 20.1549 | 19.2621 | 18.8422 (87) |             |
| Th 2                                                                        | 20.0819 | 20.0839 | 20.0860 | 20.0965 | 20.0986 | 20.1090 | 20.1090 | 20.1111 | 20.1049                   | 20.0986 | 20.0944 | 20.0902 (88) |             |
| util rest of house                                                          | 0.8601  | 0.8062  | 0.7228  | 0.5875  | 0.4421  | 0.3045  | 0.2095  | 0.2427  | 0.4206                    | 0.6618  | 0.8104  | 0.8713 (89)  |             |
| MIT 2                                                                       | 18.9479 | 17.7774 | 18.5006 | 19.2864 | 19.7684 | 20.0130 | 20.0815 | 20.0715 | 19.8954                   | 19.2089 | 18.1222 | 17.6828 (90) |             |
| Living area fraction                                                        |         |         |         |         |         |         |         |         | FLA = Living area / (4) = |         |         |              | 0.4705 (91) |
| MIT                                                                         | 19.3270 | 18.3520 | 19.0126 | 19.7363 | 20.1897 | 20.4232 | 20.4937 | 20.4809 | 20.3039                   | 19.6540 | 18.6585 | 18.2283 (92) |             |
| Temperature adjustment                                                      |         |         |         |         |         |         |         |         |                           |         |         | 0.0000       |             |
| adjusted MIT                                                                | 19.3270 | 18.3520 | 19.0126 | 19.7363 | 20.1897 | 20.4232 | 20.4937 | 20.4809 | 20.3039                   | 19.6540 | 18.6585 | 18.2283 (93) |             |

## 8. Space heating requirement

|                                                                                |           |          |          |          |          |          |          |          |          |               |          |                |
|--------------------------------------------------------------------------------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|----------|----------------|
|                                                                                | Jan       | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct           | Nov      | Dec            |
| Utilisation                                                                    | 0.8490    | 0.7713   | 0.6948   | 0.5753   | 0.4459   | 0.3199   | 0.2312   | 0.2650   | 0.4317   | 0.6444        | 0.7771   | 0.8437 (94)    |
| Useful gains                                                                   | 508.6934  | 552.6625 | 584.9413 | 577.6473 | 499.2125 | 360.9337 | 248.5936 | 257.3411 | 365.5978 | 447.6461      | 465.9469 | 480.5322 (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                                                               | 1020.6235 | 911.3699 | 845.6015 | 723.1279 | 565.0945 | 382.6709 | 255.8721 | 267.4809 | 409.7926 | 602.6569      | 773.2861 | 943.2796 (97)  |
| Space heating kWh                                                              | 380.8760  | 241.0514 | 193.9313 | 104.7460 | 49.0162  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 115.3280      | 221.2842 | 344.2841 (98a) |
| Space heating requirement - total per year (kWh/year)                          |           |          |          |          |          |          |          |          |          |               |          | 1650.5171      |
| 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                                                              | 380.8760  | 241.0514 | 193.9313 | 104.7460 | 49.0162  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 115.3280      | 221.2842 | 344.2841 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) |           |          |          |          |          |          |          |          |          |               |          | 1650.5171      |
| Space heating per m2                                                           |           |          |          |          |          |          |          |          |          | (98c) / (4) = |          | 24.3439 (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 %)                                                     |          |          |          |          |          |          |          |          |          |          |          | 230.9614 (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                                                                            | 380.8760 | 241.0514 | 193.9313 | 104.7460 | 49.0162  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 115.3280 | 221.2842 | 344.2841 (98)  |
| Space heating efficiency (main heating system 1)                                                     | 230.9614 | 230.9614 | 230.9614 | 230.9614 | 230.9614 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 230.9614 | 230.9614 | 230.9614 (210) |
| Space heating fuel (main heating system)                                                             | 164.9089 | 104.3687 | 83.9670  | 45.3522  | 21.2227  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 49.9339  | 95.8101  | 149.0656 (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                                                                            | 246.1945 | 217.7791 | 231.3225 | 203.0946 | 196.7210 | 177.0800 | 174.5443 | 181.5156 | 183.5701 | 204.9332 | 218.2289 | 243.4509 (64)  |
| Efficiency of water heater (217)m                                                                    | 322.0211 | 322.0211 | 322.0211 | 322.0211 | 322.0211 | 322.0211 | 322.0211 | 322.0211 | 322.0211 | 322.0211 | 322.0211 | 322.0211 (216) |
| Fuel for water heating, kWh/month                                                                    | 76.4529  | 67.6288  | 71.8346  | 63.0687  | 61.0895  | 54.9902  | 54.2028  | 56.3676  | 57.0056  | 63.6397  | 67.7685  | 75.6009 (219)  |
| Space cooling fuel requirement                                                                       |          |          |          |          |          |          |          |          |          |          |          |                |
| (221)m                                                                                               | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (221)   |
| Pumps and Fa                                                                                         | 11.8550  | 10.7078  | 11.8550  | 11.4726  | 11.8550  | 11.4726  | 11.8550  | 11.8550  | 11.4726  | 11.8550  | 11.4726  | 11.8550 (231)  |
| Lighting                                                                                             | 19.3560  | 15.5281  | 13.9813  | 10.2433  | 7.9122   | 6.4644   | 7.2178   | 9.3820   | 12.1862  | 15.9890  | 18.0595  | 19.8939 (232)  |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        |          |          |          |          |          |          |          |          |          |          |          |                |
| (233a)m                                                                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (233a)  |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                              |          |          |          |          |          |          |          |          |          |          |          |                |
| (234a)m                                                                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (234a)  |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)                  |          |          |          |          |          |          |          |          |          |          |          |                |
| (235a)m                                                                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235a)  |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) |          |          |          |          |          |          |          |          |          |          |          |                |
| (235c)m                                                                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235c)  |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        |          |          |          |          |          |          |          |          |          |          |          |                |
| (233b)m                                                                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (233b)  |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                              |          |          |          |          |          |          |          |          |          |          |          |                |
| (234b)m                                                                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (234b)  |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)                  |          |          |          |          |          |          |          |          |          |          |          |                |
| (235b)m                                                                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235b)  |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) |          |          |          |          |          |          |          |          |          |          |          |                |
| (235d)m                                                                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (235d)  |
| Annual totals kWh/year                                                                               |          |          |          |          |          |          |          |          |          |          |          |                |
| Space heating fuel - main system 1                                                                   |          |          |          |          |          |          |          |          |          |          |          | 714.6291 (211) |
| Space heating fuel - main system 2                                                                   |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (213)   |
| Space heating fuel - secondary                                                                       |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (215)   |
| Efficiency of water heater                                                                           |          |          |          |          |          |          |          |          |          |          |          | 322.0211       |

# Full SAP Calculation Printout



|                                                                                                                                                             |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Water heating fuel used                                                                                                                                     | 769.6498 (219)  |
| Space cooling fuel                                                                                                                                          | 0.0000 (221)    |
| Electricity for pumps and fans:<br>(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)<br>mechanical ventilation fans (SFP = 0.6750) | 139.5833 (230a) |
| Total electricity for the above, kWh/year                                                                                                                   | 139.5833 (231)  |
| Electricity for lighting (calculated in Appendix L)                                                                                                         | 156.2136 (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                                                                                                                         | 1780.0758 (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                   | 714.6291           | 0.1557                        | 111.2689                 | (261) |
| Total CO2 associated with community systems     |                    |                               | 0.0000                   | (373) |
| Water heating (other fuel)                      | 769.6498           | 0.1409                        | 108.4499                 | (264) |
| Space and water heating                         |                    |                               | 219.7188                 | (265) |
| Pumps, fans and electric keep-hot               | 139.5833           | 0.1387                        | 19.3619                  | (267) |
| Energy for lighting                             | 156.2136           | 0.1443                        | 22.5465                  | (268) |
| Total CO2, kg/year                              |                    |                               | 261.6272                 | (272) |
| EPC Dwelling Carbon Dioxide Emission Rate (DER) |                    |                               | 3.8600                   | (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               | 714.6291           | 1.5764                              | 1126.5246                  | (275) |
| Total CO2 associated with community systems |                    |                                     | 0.0000                     | (473) |
| Water heating (other fuel)                  | 769.6498           | 1.5210                              | 1170.6587                  | (278) |
| Space and water heating                     |                    |                                     | 2297.1833                  | (279) |
| Pumps, fans and electric keep-hot           | 139.5833           | 1.5128                              | 211.1616                   | (281) |
| Energy for lighting                         | 156.2136           | 1.5338                              | 239.6057                   | (282) |
| Total Primary energy kWh/year               |                    |                                     | 2747.9506                  | (286) |
| Dwelling Primary energy Rate (DPER)         |                    |                                     | 40.5300                    | (287) |

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

### 1. Overall dwelling characteristics

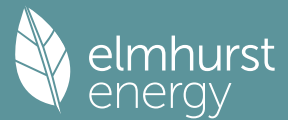
|                                                        | Area<br>(m2) | Storey height<br>(m)            | Volume<br>(m3) |                             |
|--------------------------------------------------------|--------------|---------------------------------|----------------|-----------------------------|
| Main dwelling                                          | 67.8000      | (1b)                            | x 2.5000       | (2b) = 169.5000 (1b) - (3b) |
| Ground floor                                           |              |                                 |                | (4)                         |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 67.8000      |                                 |                | (5)                         |
| Dwelling volume                                        |              | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) |                |                             |

### 2. Ventilation rate

|                                                      | m3 per hour                                         |                            |
|------------------------------------------------------|-----------------------------------------------------|----------------------------|
| Number of open chimneys                              | 0 * 80 =                                            | 0.0000 (6a)                |
| Number of open flues                                 | 0 * 20 =                                            | 0.0000 (6b)                |
| Number of chimneys / flues attached to closed fire   | 0 * 10 =                                            | 0.0000 (6c)                |
| Number of flues attached to solid fuel boiler        | 0 * 20 =                                            | 0.0000 (6d)                |
| Number of flues attached to other heater             | 0 * 35 =                                            | 0.0000 (6e)                |
| Number of blocked chimneys                           | 0 * 20 =                                            | 0.0000 (6f)                |
| Number of intermittent extract fans                  | 2 * 10 =                                            | 20.0000 (7a)               |
| Number of passive vents                              | 0 * 10 =                                            | 0.0000 (7b)                |
| Number of flueless gas fires                         | 0 * 40 =                                            | 0.0000 (7c)                |
| Infiltration due to chimneys, flues and fans         | (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = | 20.0000 / (5) = 0.1180 (8) |
| Pressure Test                                        | Yes                                                 |                            |
| Pressure Test Method                                 | Blower Door                                         |                            |
| Measured/design AP50                                 | 5.0000                                              | (17)                       |
| Infiltration rate                                    | 0.3680                                              | (18)                       |
| Number of sides sheltered                            | 3                                                   | (19)                       |
| Shelter factor                                       | (20) = 1 - [0.075 x (19)] =                         | 0.7750 (20)                |
| Infiltration rate adjusted to include shelter factor | (21) = (18) x (20) =                                | 0.2852 (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 | 0.3636 | 0.3565 | 0.3494 | 0.3137 | 0.3066 | 0.2709 | 0.2709 | 0.2638 | 0.2852 | 0.3066 | 0.3208 | 0.3351 (22b) |
| Effective ac    | 0.5661 | 0.5635 | 0.5610 | 0.5492 | 0.5470 | 0.5367 | 0.5367 | 0.5348 | 0.5407 | 0.5470 | 0.5515 | 0.5561 (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                                                    |                |                | 14.8500        | 1.1450                | 17.0038        |                       |                | (27)           |                |                |                |                |      |
| top floor exposed new                                               | 33.0000        | 14.8500        | 18.1500        | 0.1800                | 3.2670         |                       |                | (29a)          |                |                |                |                |      |
| corridor new                                                        | 52.5000        | 2.1000         | 50.4000        | 0.1800                | 9.0720         |                       |                | (29a)          |                |                |                |                |      |
| flat roof new                                                       | 31.3000        |                | 31.3000        | 0.1100                | 3.4430         |                       |                | (30)           |                |                |                |                |      |
| roof terrace new                                                    | 36.5000        |                | 36.5000        | 0.1100                | 4.0150         |                       |                | (30)           |                |                |                |                |      |
| Total net area of external elements Aum(A, m2)                      |                |                | 153.3000       |                       |                |                       |                | (31)           |                |                |                |                |      |
| Fabric heat loss, W/K = Sum (A x U)                                 |                |                |                | (26)... (30) + (32) = | 38.9008        |                       |                | (33)           |                |                |                |                |      |
| Main dwelling<br>pw                                                 |                |                | 10.7500        | 0.0000                | 0.0000         |                       |                | (32)           |                |                |                |                |      |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                   |                |                |                |                       |                |                       | 67.8437        | (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         |                |                |                |                |                |      |
| E15 Flat roof with parapet                                          |                |                |                | 13.3000               | 0.5600         |                       | 7.4480         |                |                |                |                |                |      |
| E17 Corner (inverted - internal area greater than external area)    |                |                |                | 2.5000                | -0.0900        |                       | -0.2250        |                |                |                |                |                |      |
| E18 Party wall between dwellings                                    |                |                |                | 5.0000                | 0.0600         |                       | 0.3000         |                |                |                |                |                |      |
| E24 Eaves (insulation at ceiling level - inverted)                  |                |                |                | 13.3000               | 0.2400         |                       | 3.1920         |                |                |                |                |                |      |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)          |                |                |                |                       |                |                       | 12.5050        | (36)           |                |                |                |                |      |
| Point Thermal bridges                                               |                |                |                |                       |                | (36a) =               | 0.0000         |                |                |                |                |                |      |
| Total fabric heat loss                                              |                |                |                |                       |                | (33) + (36) + (36a) = | 51.4058        | (37)           |                |                |                |                |      |
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) |                |                |                |                       |                |                       |                |                |                |                |                |                |      |
| (38)m                                                               | Jan<br>31.6654 | Feb<br>31.5218 | Mar<br>31.3811 | Apr<br>30.7200        | May<br>30.5963 | Jun<br>30.0205        | Jul<br>30.0205 | Aug<br>29.9139 | Sep<br>30.2423 | Oct<br>30.5963 | Nov<br>30.8465 | Dec<br>31.1081 | (38) |
| Heat transfer coeff                                                 | 83.0713        | 82.9277        | 82.7869        | 82.1258               | 82.0021        | 81.4263               | 81.4263        | 81.3197        | 81.6481        | 82.0021        | 82.2523        | 82.5139        | (39) |
| Average = Sum(39)m / 12 =                                           |                |                |                |                       |                |                       |                |                |                |                |                | 82.1252        |      |
| HLP                                                                 | Jan<br>1.2252  | Feb<br>1.2231  | Mar<br>1.2210  | Apr<br>1.2113         | May<br>1.2095  | Jun<br>1.2010         | Jul<br>1.2010  | Aug<br>1.1994  | Sep<br>1.2042  | Oct<br>1.2095  | Nov<br>1.2132  | Dec<br>1.2170  | (40) |
| HLP (average)                                                       |                |                |                |                       |                |                       |                |                |                |                |                | 1.2113         |      |
| Days in mont                                                        | 31             | 28             | 31             | 30                    | 31             | 30                    | 31             | 31             | 30             | 31             | 30             | 31             |      |

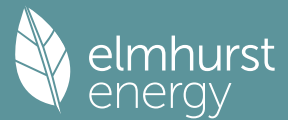
## 4. Water heating energy requirements (kWh/year)

|                                                                 |          |          |          |          |          |          |          |          |          |                                                                                |          |                |             |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--------------------------------------------------------------------------------|----------|----------------|-------------|
| Assumed occupancy                                               |          |          |          |          |          |          |          |          |          |                                                                                |          |                | 2.1916 (42) |
| Hot water usage for mixer showers                               | 60.9647  | 60.0486  | 58.7135  | 56.1591  | 54.2740  | 52.1718  | 50.9769  | 52.3019  | 53.7543  | 56.0114                                                                        | 58.6207  | 60.7312 (42a)  |             |
| Hot water usage for baths                                       | 26.3401  | 25.9489  | 25.3980  | 24.3823  | 23.6217  | 22.7784  | 22.3229  | 22.8699  | 23.4655  | 24.3679                                                                        | 25.4045  | 26.2510 (42b)  |             |
| Hot water usage for other uses                                  | 37.0737  | 35.7255  | 34.3774  | 33.0293  | 31.6811  | 30.3330  | 30.3330  | 31.6811  | 33.0293  | 34.3774                                                                        | 35.7255  | 37.0737 (42c)  |             |
| Average daily hot water use (litres/day)                        |          |          |          |          |          |          |          |          |          |                                                                                |          | 114.3322 (43)  |             |
|                                                                 | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct                                                                            | Nov      | Dec            |             |
| Daily hot water use                                             | 124.3785 | 121.7230 | 118.4889 | 113.5707 | 109.5769 | 105.2832 | 103.6328 | 106.8529 | 110.2490 | 114.7567                                                                       | 119.7507 | 124.0559 (44)  |             |
| Energy content (annual)                                         | 196.9851 | 173.3319 | 182.1131 | 155.4726 | 147.5116 | 129.4580 | 125.3349 | 132.3062 | 135.9481 | 155.7238                                                                       | 170.6069 | 194.2415 (45)  |             |
| Distribution loss (46)m = 0.15 x (45)m                          | 29.5478  | 25.9998  | 27.3170  | 23.3209  | 22.1267  | 19.4187  | 18.8002  | 19.8459  | 20.3922  | 23.3586                                                                        | 25.5910  | 29.1362 (46)   |             |
| Water storage loss:                                             |          |          |          |          |          |          |          |          |          |                                                                                |          |                |             |
| Store volume                                                    |          |          |          |          |          |          |          |          |          |                                                                                |          | 150.0000 (47)  |             |
| a) If manufacturer declared loss factor is known (kWh/day):     |          |          |          |          |          |          |          |          |          |                                                                                |          | 1.3938 (48)    |             |
| Temperature factor from Table 2b                                |          |          |          |          |          |          |          |          |          |                                                                                |          | 0.5400 (49)    |             |
| Enter (49) or (54) in (55)                                      |          |          |          |          |          |          |          |          |          |                                                                                |          | 0.7527 (55)    |             |
| Total storage loss                                              | 23.3325  | 21.0745  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | 23.3325  | 22.5798  | 23.3325                                                                        | 22.5798  | 23.3325 (56)   |             |
| If cylinder contains dedicated solar storage                    | 23.3325  | 21.0745  | 23.3325  | 22.5798  | 23.3325  | 22.5798  | 23.3325  | 23.3325  | 22.5798  | 23.3325                                                                        | 22.5798  | 23.3325 (57)   |             |
| Primary loss                                                    | 23.2624  | 21.0112  | 23.2624  | 22.5120  | 23.2624  | 22.5120  | 23.2624  | 23.2624  | 22.5120  | 23.2624                                                                        | 22.5120  | 23.2624 (59)   |             |
| Combi loss                                                      | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                                                         | 0.0000   | 0.0000 (61)    |             |
| Total heat required for water heating calculated for each month | 243.5800 | 215.4176 | 228.7080 | 200.5644 | 194.1065 | 174.5499 | 171.9298 | 178.9011 | 181.0399 | 202.3187                                                                       | 215.6987 | 240.8364 (62)  |             |
| WWHRS                                                           | -27.8705 | -24.6489 | -25.8109 | -21.3725 | -19.9184 | -17.0443 | -15.9763 | -16.9892 | -17.6347 | -20.7894                                                                       | -23.5518 | -27.3544 (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                                                 | 215.7095 | 190.7687 | 202.8970 | 179.1920 | 174.1881 | 157.5056 | 155.9535 | 161.9119 | 163.4053 | 181.5293                                                                       | 192.1469 | 213.4820 (64)  |             |
| 12Total per year (kWh/year)                                     |          |          |          |          |          |          |          |          |          | Total per year (kWh/year) = Sum(64)m =                                         |          | 2188.6897 (64) |             |
| Electric shower(s)                                              |          |          |          |          |          |          |          |          |          |                                                                                |          | 2189 (64)      |             |
|                                                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                                                         | 0.0000   | 0.0000 (64a)   |             |
|                                                                 |          |          |          |          |          |          |          |          |          | Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = |          | 0.0000 (64a)   |             |
| Heat gains from water heating, kWh/month                        | 102.7735 | 91.3014  | 97.8285  | 87.7681  | 86.3235  | 79.1183  | 78.9498  | 81.2677  | 81.2762  | 89.0541                                                                        | 92.8003  | 101.8612 (65)  |             |

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

|                                                                                     |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
|-------------------------------------------------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|
| Metabolic gains (Table 5), Watts                                                    |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| (66)m                                                                               | Jan<br>109.5776 | Feb<br>109.5776 | Mar<br>109.5776 | Apr<br>109.5776 | May<br>109.5776 | Jun<br>109.5776 | Jul<br>109.5776 | Aug<br>109.5776 | Sep<br>109.5776 | Oct<br>109.5776 | Nov<br>109.5776 | Dec<br>109.5776 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 96.9448                                                                             | 107.3317        | 96.9448         | 100.1763        | 96.9448         | 100.1763        | 96.9448         | 96.9448         | 100.1763        | 96.9448         | 100.1763        | 96.9448         | 96.9448         | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 192.1089                                                                            | 194.1024        | 189.0789        | 178.3844        | 164.8845        | 152.1965        | 143.7201        | 141.7267        | 146.7502        | 157.4447        | 170.9446        | 183.6326        | 183.6326        | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 33.9578                                                                             | 33.9578         | 33.9578         | 33.9578         | 33.9578         | 33.9578         | 33.9578         | 33.9578         | 33.9578         | 33.9578         | 33.9578         | 33.9578         | 33.9578         | (69) |
| Pumps, fans                                                                         | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | 3.0000          | (70) |
| Losses e.g. evaporation (negative values) (Table 5)                                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| -87.6621                                                                            | -87.6621        | -87.6621        | -87.6621        | -87.6621        | -87.6621        | -87.6621        | -87.6621        | -87.6621        | -87.6621        | -87.6621        | -87.6621        | -87.6621        | (71) |
| Water heating gains (Table 5)                                                       |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |
| 138.1364                                                                            | 135.8652        | 131.4899        | 121.9002        | 116.0262        | 109.8865        | 106.1153        | 109.2308        | 112.8836        | 119.6963        | 128.8893        | 136.9102        | 136.9102        | (72) |

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Total internal gains  
486.0633 496.1726 476.3869 459.3341 436.7288 418.1325 402.6535 403.7755 415.6834 432.9591 458.8834 476.3608 (73)

## 6. Solar gains

| [Jan]       | Area<br>m2 |          | Solar flux<br>Table 6a<br>W/m2 |          | Specific data<br>or Table 6b |          | Specific FF<br>or Table 6c |          | Access<br>factor<br>Table 6d |          | Gains<br>W   |               |
|-------------|------------|----------|--------------------------------|----------|------------------------------|----------|----------------------------|----------|------------------------------|----------|--------------|---------------|
| North       | 4.9500     |          | 10.6334                        |          | 0.6300                       |          | 0.7000                     |          | 0.7700                       |          | 16.0860 (74) |               |
| East        | 9.9000     |          | 19.6403                        |          | 0.6300                       |          | 0.7000                     |          | 0.7700                       |          | 59.4230 (76) |               |
| Solar gains | 75.5090    | 146.9852 | 243.6740                       | 363.1055 | 455.1985                     | 471.2723 | 446.4424                   | 376.0752 | 285.4550                     | 174.5266 | 93.9376      | 62.2767 (83)  |
| Total gains | 561.5723   | 643.1578 | 720.0609                       | 822.4396 | 891.9273                     | 889.4048 | 849.0959                   | 779.8508 | 701.1384                     | 607.4857 | 552.8210     | 538.6375 (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                                                                         | 15.3810                   | 15.4077 | 15.4339 | 15.5581 | 15.5816 | 15.6918 | 15.6918 | 15.7123 | 15.6491 | 15.5816 | 15.5342 | 15.4849      |
| alpha                                                                       | 2.0254                    | 2.0272  | 2.0289  | 2.0372  | 2.0388  | 2.0461  | 2.0461  | 2.0475  | 2.0433  | 2.0388  | 2.0356  | 2.0323       |
| util living area                                                            | 0.8981                    | 0.8676  | 0.8198  | 0.7318  | 0.6172  | 0.4848  | 0.3770  | 0.4176  | 0.5958  | 0.7761  | 0.8678  | 0.9051 (86)  |
| MIT                                                                         | 17.8112                   | 18.1908 | 18.7927 | 19.5763 | 20.2287 | 20.6719 | 20.8606 | 20.8232 | 20.4693 | 19.6134 | 18.5911 | 17.7429 (87) |
| Th 2                                                                        | 19.8999                   | 19.9015 | 19.9032 | 19.9110 | 19.9124 | 19.9192 | 19.9192 | 19.9205 | 19.9166 | 19.9124 | 19.9095 | 19.9064 (88) |
| util rest of house                                                          | 0.8868                    | 0.8533  | 0.8000  | 0.7020  | 0.5734  | 0.4225  | 0.2968  | 0.3358  | 0.5354  | 0.7440  | 0.8511  | 0.8945 (89)  |
| MIT 2                                                                       | 16.2361                   | 16.7059 | 17.4484 | 18.3998 | 19.1630 | 19.6527 | 19.8344 | 19.8069 | 19.4549 | 18.4705 | 17.2166 | 16.1533 (90) |
| Living area fraction                                                        | fLA = Living area / (4) = |         |         |         |         |         |         |         |         |         |         |              |
| MIT                                                                         | 16.9772                   | 17.4046 | 18.0809 | 18.9533 | 19.6644 | 20.1322 | 20.3172 | 20.2851 | 19.9322 | 19.0083 | 17.8633 | 16.9012 (92) |
| Temperature adjustment                                                      | 0.0000                    |         |         |         |         |         |         |         |         |         |         |              |
| adjusted MIT                                                                | 16.9772                   | 17.4046 | 18.0809 | 18.9533 | 19.6644 | 20.1322 | 20.3172 | 20.2851 | 19.9322 | 19.0083 | 17.8633 | 16.9012 (93) |

## 8. Space heating requirement

|                                                                                |                            |           |          |          |          |          |          |          |          |          |          |                |
|--------------------------------------------------------------------------------|----------------------------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------|
|                                                                                | Jan                        | Feb       | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec            |
| Utilisation                                                                    | 0.8465                     | 0.8114    | 0.7598   | 0.6721   | 0.5626   | 0.4354   | 0.3274   | 0.3647   | 0.5363   | 0.7124   | 0.8107   | 0.8551 (94)    |
| Useful gains                                                                   | 475.3530                   | 521.8376  | 547.1165 | 552.7214 | 501.7592 | 387.2383 | 278.0134 | 284.3738 | 376.0322 | 432.7463 | 448.1503 | 460.5838 (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                                                               | 1053.1097                  | 1036.9740 | 958.7481 | 825.6383 | 653.0985 | 450.4668 | 302.6808 | 315.9342 | 476.1892 | 689.4948 | 885.3091 | 1048.0254 (97) |
| Space heating kWh                                                              | 429.8510                   | 346.1717  | 306.2539 | 196.5001 | 112.5964 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 191.0209 | 314.7543 | 437.0566 (98a) |
| Space heating requirement - total per year (kWh/year)                          | 2334.2049                  |           |          |          |          |          |          |          |          |          |          |                |
| 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                                                              | 429.8510                   | 346.1717  | 306.2539 | 196.5001 | 112.5964 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 191.0209 | 314.7543 | 437.0566 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) | 2334.2049                  |           |          |          |          |          |          |          |          |          |          |                |
| Space heating per m2                                                           | (98c) / (4) = 34.4278 (99) |           |          |          |          |          |          |          |          |          |          |                |

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

|                                                                                                      |                                                               |          |           |           |           |           |           |           |           |           |          |                 |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|-----------------|
| Fraction of space heat from secondary/supplementary system (Table 11)                                |                                                               |          |           |           |           |           |           |           |           |           |          | 0.0000 (201)    |
| Fraction of space heat from main system(s)                                                           |                                                               |          |           |           |           |           |           |           |           |           |          | 1.0000 (202)    |
| Efficiency of main space heating system 1 (in %)                                                     |                                                               |          |           |           |           |           |           |           |           |           |          | 92.3000 (206)   |
| Efficiency of main space heating system 2 (in %)                                                     |                                                               |          |           |           |           |           |           |           |           |           |          | 0.0000 (207)    |
| Efficiency of secondary/supplementary heating system, %                                              |                                                               |          |           |           |           |           |           |           |           |           |          | 0.0000 (208)    |
|                                                                                                      | Jan                                                           | Feb      | Mar       | Apr       | May       | Jun       | Jul       | Aug       | Sep       | Oct       | Nov      | Dec             |
| Space heating requirement                                                                            | 429.8510                                                      | 346.1717 | 306.2539  | 196.5001  | 112.5964  | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 191.0209  | 314.7543 | 437.0566 (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)                                                             | 465.7107                                                      | 375.0506 | 331.8027  | 212.8929  | 121.9896  | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 206.9566  | 341.0123 | 473.5174 (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                                                                                        | 215.7095                                                      | 190.7687 | 202.8970  | 179.1920  | 174.1881  | 157.5056  | 155.9535  | 161.9119  | 163.4053  | 181.5293  | 192.1469 | 213.4820 (64)   |
| Water heating requirement                                                                            | 85.5751                                                       | 85.3789  | 84.9807   | 84.2670   | 83.1070   | 79.8000   | 79.8000   | 79.8000   | 79.8000   | 84.1743   | 85.1593  | 79.8000 (216)   |
| Efficiency of water heater                                                                           | 252.0704                                                      | 223.4379 | 238.7567  | 212.6478  | 209.5950  | 197.3754  | 195.4304  | 202.8972  | 204.7685  | 215.6590  | 225.6323 | 85.6307 (217)   |
| Fuel for water heating, kWh/month                                                                    | 0.0000                                                        | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 249.3053 (219)  |
| Space cooling fuel requirement                                                                       | 0.0000                                                        | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000 (221)    |
| (221)m                                                                                               | 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)    |
| Pumps and Fa                                                                                         | 20.1432                                                       | 16.1596  | 14.5500   | 10.6599   | 8.2340    | 6.7273    | 7.5114    | 9.7635    | 12.6819   | 16.6393   | 18.7941  | 20.7031 (232)   |
| Lighting                                                                                             | Electricity generated by PVs (Appendix M) (negative quantity) |          |           |           |           |           |           |           |           |           |          |                 |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        | -52.8255                                                      | -69.6668 | -93.7892  | -98.6108  | -100.9788 | -92.4641  | -91.3284  | -88.7372  | -83.5330  | -76.2574  | -56.3448 | -46.2602 (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)                                        | -46.4470                                                      | -95.1580 | -184.6240 | -271.0368 | -352.5588 | -352.1230 | -347.9402 | -297.1655 | -221.3354 | -133.8328 | -61.2446 | -36.9223 (233b) |

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|                                                                                                      |        |        |        |        |        |        |        |        |        |        |        |        |            |        |
|------------------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------|--------|
| 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 | 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 | 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 | 0.0000     | (235d) |
| Annual totals kWh/year                                                                               |        |        |        |        |        |        |        |        |        |        |        |        |            |        |
| Space heating fuel - main system 1                                                                   |        |        |        |        |        |        |        |        |        |        |        |        | 2528.9327  | (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                                                                              |        |        |        |        |        |        |        |        |        |        |        |        | 2627.5758  | (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)                                                  |        |        |        |        |        |        |        |        |        |        |        |        | 162.5672   | (232)  |
| Energy saving/generation technologies (Appendices M ,N and Q)                                        |        |        |        |        |        |        |        |        |        |        |        |        |            |        |
| PV generation                                                                                        |        |        |        |        |        |        |        |        |        |        |        |        | -3351.1850 | (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                                                                  |        |        |        |        |        |        |        |        |        |        |        |        | 2053.8907  | (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                 | 2528.9327          | 0.2100                        | 531.0759 (261)           |
| Total CO2 associated with community systems   |                    |                               | 0.0000 (373)             |
| Water heating (other fuel)                    | 2627.5758          | 0.2100                        | 551.7909 (264)           |
| Space and water heating                       |                    |                               | 1082.8668 (265)          |
| Pumps, fans and electric keep-hot             | 86.0000            | 0.1387                        | 11.9293 (267)            |
| Energy for lighting                           | 162.5672           | 0.1443                        | 23.4635 (268)            |
| Energy saving/generation technologies         |                    |                               |                          |
| PV Unit electricity used in dwelling          | -950.7964          | 0.1360                        | -129.3198                |
| PV Unit electricity exported                  | -2400.3886         | 0.1266                        | -303.8534                |
| Total                                         |                    |                               | -433.1731 (269)          |
| Total CO2, kg/year                            |                    |                               | 685.0864 (272)           |
| EPC Target Carbon Dioxide Emission Rate (TER) |                    |                               | 10.1000 (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               | 2528.9327          | 1.1300                              | 2857.6940 (275)            |
| Total CO2 associated with community systems |                    |                                     | 0.0000 (473)               |
| Water heating (other fuel)                  | 2627.5758          | 1.1300                              | 2969.1606 (278)            |
| Space and water heating                     |                    |                                     | 5826.8546 (279)            |
| Pumps, fans and electric keep-hot           | 86.0000            | 1.5128                              | 130.1008 (281)             |
| Energy for lighting                         | 162.5672           | 1.5338                              | 249.3511 (282)             |
| Energy saving/generation technologies       |                    |                                     |                            |
| PV Unit electricity used in dwelling        | -950.7964          | 1.5028                              | -1428.8139                 |
| PV Unit electricity exported                | -2400.3886         | 0.4647                              | -1115.4247                 |
| Total                                       |                    |                                     | -2544.2386 (283)           |
| Total Primary energy kWh/year               |                    |                                     | 3662.0679 (286)            |
| Target Primary Energy Rate (TPER)           |                    |                                     | 54.0100 (287)              |