

# Full SAP Calculation Printout



|                                    |                                                        |  |               |               |                |             |           |
|------------------------------------|--------------------------------------------------------|--|---------------|---------------|----------------|-------------|-----------|
| Property Reference                 | UNIT 39                                                |  |               |               | Issued on Date | 28/06/2023  |           |
| Assessment Reference               | UNIT 39                                                |  |               | Prop Type Ref |                |             |           |
| Property                           | Alexander House, UNIT 39, 205-207 King's Road, RG1 4LS |  |               |               |                |             |           |
|                                    |                                                        |  |               |               |                |             |           |
| SAP Rating                         | 79 C                                                   |  | DER           | 5.51          |                | TER         | 14.27     |
| Environmental                      | 96 A                                                   |  | % DER < TER   |               |                |             | 61.39     |
| CO <sub>2</sub> Emissions (t/year) | 0.35                                                   |  | DFEE          | 48.29         |                | TFEE        | 46.49     |
| Compliance Check                   | See BREL                                               |  | % DFEE < TFEE |               |                |             | -3.88     |
| % DPER < TPER                      | 22.84                                                  |  | DPER          | 57.81         |                | TPER        | 74.92     |
|                                    |                                                        |  |               |               |                |             |           |
| Assessor Details                   | Mr. Ondrej Gajdos                                      |  |               |               |                | Assessor ID | W452-0001 |
| Client                             |                                                        |  |               |               |                |             |           |

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

## 1. Overall dwelling characteristics

|                                                        | Area<br>(m <sup>2</sup> ) | Storey height<br>(m)            | Volume<br>(m <sup>3</sup> ) |
|--------------------------------------------------------|---------------------------|---------------------------------|-----------------------------|
| Ground floor                                           | 67.8000 (1b)              | x 2.5000 (2b)                   | = 169.5000 (1b) - (4)       |
| 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)    |

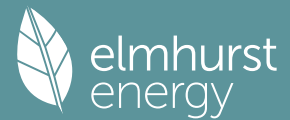
|                                                                                                    |                                         |
|----------------------------------------------------------------------------------------------------|-----------------------------------------|
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = | Air changes per hour                    |
| Pressure test                                                                                      | 0.0000 / (5) = 0.0000 (8)               |
| Pressure Test Method                                                                               | Yes                                     |
| Measured/design AP50                                                                               | Blower Door                             |
| Infiltration rate                                                                                  | 4.0000 (17)                             |
| Number of sides sheltered                                                                          | 0.2000 (18)                             |
|                                                                                                    | 3 (19)                                  |
| Shelter factor                                                                                     | (20) = 1 - [0.075 x (19)] = 0.7750 (20) |
| Infiltration rate adjusted to include shelter factor                                               | (21) = (18) x (20) = 0.1550 (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                                                                                         | 0.1976 | 0.1938 | 0.1899 | 0.1705 | 0.1666 | 0.1473 | 0.1473 | 0.1434 | 0.1550 | 0.1666 | 0.1744 | 0.1821 (22b) |
| Mechanical extract ventilation - centralised                                                            |        |        |        |        |        |        |        |        |        |        |        |              |
| 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) |
| Effective ac                                                                                            | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 (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 |
|---------------|-------------------------|----------------------------|---------------------------|-------------------------------|--------------|--------------------------------|---------------|
| 1 (Uw = 1.30) |                         |                            | 6.5000                    | 1.2357                        | 8.0323       |                                | (27)          |
| 2 (Uw = 1.30) |                         |                            | 6.5000                    | 1.2357                        | 8.0323       |                                | (27)          |
| 3 (Uw = 1.30) |                         |                            | 6.5000                    | 1.2357                        | 8.0323       |                                | (27)          |
| 1             |                         |                            | 2.1000                    | 1.0000                        | 2.1000       |                                | (26)          |

# Full SAP Calculation Printout



|                                                |         |         |                      |         |         |         |                 |
|------------------------------------------------|---------|---------|----------------------|---------|---------|---------|-----------------|
| top floor exposed new                          | 33.0000 | 19.5000 | 13.5000              | 0.1800  | 2.4300  | 18.0000 | 243.0000 (29a)  |
| corridor new                                   | 52.5000 | 2.1000  | 50.4000              | 0.2400  | 12.0960 | 60.0000 | 3024.0000 (29a) |
| lift/stair new                                 | 17.0000 |         | 17.0000              | 0.2400  | 4.0800  | 9.0000  | 153.0000 (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, m2) |         |         | 170.3000             |         |         |         | (31)            |
| Fabric heat loss, W/K = Sum (A x U)            |         |         | (26)...(30) + (32) = | 53.6170 |         |         | (33)            |
| 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)  |

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 7071.2000 (34)  
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 104.2950 (35)

## List of Thermal Bridges

| K1 Element                                                       | Length  | Psi-value | Total                              |
|------------------------------------------------------------------|---------|-----------|------------------------------------|
| E2 Other lintels (including other steel lintels)                 | 8.8000  | 0.0500    | 0.4400                             |
| E3 Sill                                                          | 7.8000  | 0.0500    | 0.3900                             |
| E4 Jamb                                                          | 19.2000 | 0.0500    | 0.9600                             |
| E7 Party floor between dwellings (in blocks of flats)            | 27.8000 | 0.0700    | 1.9460                             |
| E14 Flat roof                                                    | 32.2000 | 0.0800    | 2.5760                             |
| E15 Flat roof with parapet                                       | 13.4000 | 0.1500    | 2.0100                             |
| E16 Corner (normal)                                              | 12.5000 | 0.0900    | 1.1250                             |
| E17 Corner (inverted - internal area greater than external area) | 10.0000 | -0.0900   | -0.9000                            |
| E18 Party wall between dwellings                                 | 5.0000  | 0.0600    | 0.3000                             |
| E24 Eaves (insulation at ceiling level - inverted)               | 4.4000  | 0.2400    | 1.0560                             |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)       |         |           | 9.9030 (36)                        |
| Point Thermal bridges                                            |         |           | (36a) = 0.0000                     |
| Total fabric heat loss                                           |         |           | (33) + (36) + (36a) = 63.5200 (37) |

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

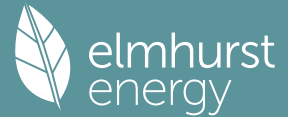
| (38)m                     | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |        |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| Heat transfer coeff       | 27.9675 | 27.9675 | 27.9675 | 27.9675 | 27.9675 | 27.9675 | 27.9675 | 27.9675 | 27.9675 | 27.9675 | 27.9675 | 27.9675 | (38)   |
| Average = Sum(39)m / 12 = | 91.4875 | 91.4875 | 91.4875 | 91.4875 | 91.4875 | 91.4875 | 91.4875 | 91.4875 | 91.4875 | 91.4875 | 91.4875 | 91.4875 | (39)   |
| HLP                       | 1.3494  | 1.3494  | 1.3494  | 1.3494  | 1.3494  | 1.3494  | 1.3494  | 1.3494  | 1.3494  | 1.3494  | 1.3494  | 1.3494  | (40)   |
| HLP (average)             |         |         |         |         |         |         |         |         |         |         |         |         | 1.3494 |
| 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 | 182.1130 | 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 = 1899.0336 |
| 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:                                                            |          |          |          |          |          |          |          |          |          |          |          |          | 150.0000 (47)                |
| Store volume                                                                   |          |          |          |          |          |          |          |          |          |          |          |          | 1.1500 (48)                  |
| a) If manufacturer declared loss factor is known (kWh/day):                    |          |          |          |          |          |          |          |          |          |          |          |          | 0.5400 (49)                  |
| Temperature factor from Table 2b                                               |          |          |          |          |          |          |          |          |          |          |          |          | 0.6210 (55)                  |
| Enter (49) or (54) in (55)                                                     |          |          |          |          |          |          |          |          |          |          |          |          |                              |
| Total storage loss                                                             | 19.2510  | 17.3880  | 19.2510  | 18.6300  | 19.2510  | 18.6300  | 19.2510  | 19.2510  | 18.6300  | 19.2510  | 18.6300  | 19.2510  | (56)                         |
| If cylinder contains dedicated solar storage                                   | 19.2510  | 17.3880  | 19.2510  | 18.6300  | 19.2510  | 18.6300  | 19.2510  | 19.2510  | 18.6300  | 19.2510  | 18.6300  | 19.2510  | (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                | 239.4985 | 211.7311 | 224.6264 | 196.6146 | 190.0250 | 170.6000 | 167.8483 | 174.8196 | 177.0901 | 198.2372 | 211.7489 | 236.7549 | (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                                                                | 239.4985 | 211.7311 | 224.6264 | 196.6146 | 190.0250 | 170.6000 | 167.8483 | 174.8196 | 177.0901 | 198.2372 | 211.7489 | 236.7549 | (64)                         |
| 12Total per year (kWh/year)                                                    |          |          |          |          |          |          |          |          |          |          |          |          | 2399.5946 (64)               |
| Electric shower(s)                                                             | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (64a)                        |
| Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = |          |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (64a)                 |
| Heat gains from water heating, kWh/month                                       | 99.5083  | 88.3522  | 94.5633  | 84.6082  | 83.0583  | 75.9584  | 75.6846  | 78.0025  | 78.1163  | 85.7889  | 89.6404  | 98.5960  | (65)                         |

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

# Full SAP Calculation Printout



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 | 183.6325 | (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)                                                       | 133.7477 | 131.4765 | 127.1012 | 117.5114 | 111.6375 | 105.4978 | 101.7266 | 104.8421 | 108.4949 | 115.3076 | 124.5005 | 132.5215 | (72) |
| Total internal gains                                                                | 478.6267 | 488.7309 | 468.9502 | 451.8958 | 429.2922 | 413.6943 | 398.2169 | 399.3389 | 411.2451 | 425.5225 | 451.4451 | 468.9242 | (73) |

## 6. Solar gains

| [Jan] | Area<br>m2 | Solar flux<br>Table 6a<br>W/m2 | 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) |

|             |          |          |          |          |           |           |           |          |          |          |          |          |      |
|-------------|----------|----------|----------|----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|------|
| 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 | 591.9447 | 709.3146 | 834.6371 | 996.8161 | 1112.4184 | 1120.9428 | 1068.2026 | 963.7231 | 839.6336 | 687.4383 | 592.4194 | 562.3841 | (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                                                                         | 21.4699 | 21.4699 | 21.4699 | 21.4699 | 21.4699 | 21.4699 | 21.4699 | 21.4699 | 21.4699                   | 21.4699 | 21.4699 | 21.4699      |
| alpha                                                                       | 2.4313  | 2.4313  | 2.4313  | 2.4313  | 2.4313  | 2.4313  | 2.4313  | 2.4313  | 2.4313                    | 2.4313  | 2.4313  | 2.4313       |
| util living area                                                            | 0.9365  | 0.9045  | 0.8490  | 0.7447  | 0.6090  | 0.4647  | 0.3542  | 0.4018  | 0.6024                    | 0.8127  | 0.9101  | 0.9432 (86)  |
| Living                                                                      | 18.3258 | 18.7162 | 19.3025 | 19.9983 | 20.5238 | 20.8225 | 20.9334 | 20.9078 | 20.6554                   | 19.9210 | 18.9878 | 18.2350      |
| Non living                                                                  | 16.7368 | 17.2228 | 17.9456 | 18.7770 | 19.3701 | 19.6754 | 19.7697 | 19.7538 | 19.5303                   | 18.7160 | 17.5735 | 16.6231      |
| 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                                                                         | 19.6320 | 18.7162 | 19.3025 | 19.9983 | 20.5238 | 20.8225 | 20.9334 | 20.9078 | 20.6554                   | 19.9210 | 18.9878 | 18.6218 (87) |
| Th 2                                                                        | 19.8024 | 19.8024 | 19.8024 | 19.8024 | 19.8024 | 19.8024 | 19.8024 | 19.8024 | 19.8024                   | 19.8024 | 19.8024 | 19.8024 (88) |
| util rest of house                                                          | 0.9267  | 0.8904  | 0.8270  | 0.7088  | 0.5561  | 0.3925  | 0.2656  | 0.3087  | 0.5294                    | 0.7764  | 0.8943  | 0.9344 (89)  |
| MIT 2                                                                       | 18.5802 | 17.2228 | 17.9456 | 18.7770 | 19.3701 | 19.6754 | 19.7697 | 19.7538 | 19.5303                   | 18.7160 | 17.5735 | 17.1960 (90) |
| Living area fraction                                                        |         |         |         |         |         |         |         |         | fLA = Living area / (4) = |         |         | 0.4705 (91)  |
| MIT                                                                         | 19.0751 | 17.9255 | 18.5840 | 19.3516 | 19.9129 | 20.2151 | 20.3172 | 20.2967 | 20.0597                   | 19.2829 | 18.2389 | 17.8668 (92) |
| Temperature adjustment                                                      |         |         |         |         |         |         |         |         |                           |         |         | 0.0000       |
| adjusted MIT                                                                | 19.0751 | 17.9255 | 18.5840 | 19.3516 | 19.9129 | 20.2151 | 20.3172 | 20.2967 | 20.0597                   | 19.2829 | 18.2389 | 17.8668 (93) |

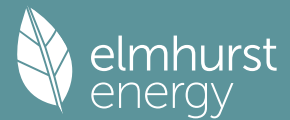
## 8. Space heating requirement

|                                                                                | Jan       | Feb       | Mar       | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct           | Nov       | Dec       |       |
|--------------------------------------------------------------------------------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|---------------|-----------|-----------|-------|
| Utilisation                                                                    | 0.9198    | 0.8621    | 0.8001    | 0.6937   | 0.5613   | 0.4183   | 0.3047   | 0.3484   | 0.5462   | 0.7578        | 0.8674    | 0.9157    | (94)  |
| Useful gains                                                                   | 544.4646  | 611.4955  | 667.7746  | 691.4759 | 624.4090 | 468.8838 | 325.4512 | 335.8021 | 458.6313 | 520.9562      | 513.8727  | 514.9766  | (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                                                               | 1351.7340 | 1191.6680 | 1105.5339 | 956.1900 | 751.3778 | 513.7097 | 340.0807 | 356.5009 | 545.2338 | 794.3809      | 1019.0698 | 1250.3440 | (97)  |
| Space heating kWh                                                              | 600.6084  | 389.8759  | 325.6929  | 190.5941 | 94.4648  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 203.4280      | 363.7420  | 547.1133  | (98a) |
| Space heating requirement - total per year (kWh/year)                          |           |           |           |          |          |          |          |          |          |               |           | 2715.5194 |       |
| 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                                                              | 600.6084  | 389.8759  | 325.6929  | 190.5941 | 94.4648  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 203.4280      | 363.7420  | 547.1133  | (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) |           |           |           |          |          |          |          |          |          |               |           | 2715.5194 |       |
| Space heating per m2                                                           |           |           |           |          |          |          |          |          |          | (98c) / (4) = |           | 40.0519   | (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 %)                      | 244.6181 | (206) |
| Efficiency of main space heating system 2 (in %)                      | 0.0000   | (207) |

# Full SAP Calculation Printout



|                                                                                                      |          |          |          |          |          |          |          |          |          |          |          |                 |
|------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------------|
| Efficiency of secondary/supplementary heating system, %                                              |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (208)    |
|                                                                                                      | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec             |
| Space heating requirement                                                                            | 600.6084 | 389.8759 | 325.6929 | 190.5941 | 94.4648  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 203.4280 | 363.7420 | 547.1133 (98)   |
| Space heating efficiency (main heating system 1)                                                     | 244.6181 | 244.6181 | 244.6181 | 244.6181 | 244.6181 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 244.6181 | 244.6181 | 244.6181 (210)  |
| Space heating fuel (main heating system)                                                             | 245.5291 | 159.3815 | 133.1434 | 77.9150  | 38.6173  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 83.1615  | 148.6979 | 223.6602 (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                                                                            | 239.4985 | 211.7311 | 224.6264 | 196.6146 | 190.0250 | 170.6000 | 167.8483 | 174.8196 | 177.0901 | 198.2372 | 211.7489 | 236.7549 (64)   |
| Efficiency of water heater                                                                           |          |          |          |          |          |          |          |          |          |          |          | 189.9382 (216)  |
| (217)m                                                                                               | 189.9382 | 189.9382 | 189.9382 | 189.9382 | 189.9382 | 189.9382 | 189.9382 | 189.9382 | 189.9382 | 189.9382 | 189.9382 | 189.9382 (217)  |
| Fuel for water heating, kWh/month                                                                    | 126.0928 | 111.4737 | 118.2629 | 103.5150 | 100.0457 | 89.8187  | 88.3699  | 92.0403  | 93.2356  | 104.3693 | 111.4830 | 124.6484 (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                                                                                         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (231)    |
| Lighting                                                                                             | 20.1333  | 16.1516  | 14.5428  | 10.6547  | 8.2300   | 6.7239   | 7.5076   | 9.7587   | 12.6756  | 16.6311  | 18.7848  | 20.6928 (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                                                                   |          |          |          |          |          |          |          |          |          |          |          | 1110.1059 (211) |
| Space heating fuel - main system 2                                                                   |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (213)    |
| Space heating fuel - secondary                                                                       |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (215)    |
| Efficiency of water heater                                                                           |          |          |          |          |          |          |          |          |          |          |          | 189.9382        |
| Water heating fuel used                                                                              |          |          |          |          |          |          |          |          |          |          |          | 1263.3553 (219) |
| Space cooling fuel                                                                                   |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (221)    |
| Electricity for pumps and fans:                                                                      |          |          |          |          |          |          |          |          |          |          |          |                 |
| Total electricity for the above, kWh/year                                                            |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (231)    |
| Electricity for lighting (calculated in Appendix L)                                                  |          |          |          |          |          |          |          |          |          |          |          | 162.4869 (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                                                                  |          |          |          |          |          |          |          |          |          |          |          | 2535.9481 (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                   | 1110.1059          | 0.1553                        | 172.3525 (261)           |
| Total CO2 associated with community systems     |                    |                               | 0.0000 (373)             |
| Water heating (other fuel)                      | 1263.3553          | 0.1410                        | 178.1082 (264)           |
| Space and water heating                         |                    |                               | 350.4607 (265)           |
| Pumps, fans and electric keep-hot               | 0.0000             | 0.0000                        | 0.0000 (267)             |
| Energy for lighting                             | 162.4869           | 0.1443                        | 23.4519 (268)            |
| Total CO2, kg/year                              |                    |                               | 373.9126 (272)           |
| EPC Dwelling Carbon Dioxide Emission Rate (DER) |                    |                               | 5.5100 (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               | 1110.1059          | 1.5747                              | 1748.1322 (275)            |
| Total CO2 associated with community systems |                    |                                     | 0.0000 (473)               |
| Water heating (other fuel)                  | 1263.3553          | 1.5213                              | 1921.9400 (278)            |
| Space and water heating                     |                    |                                     | 3670.0722 (279)            |
| Pumps, fans and electric keep-hot           | 0.0000             | 0.0000                              | 0.0000 (281)               |
| Energy for lighting                         | 162.4869           | 1.5338                              | 249.2279 (282)             |
| Total Primary energy kWh/year               |                    |                                     | 3919.3001 (286)            |

# Full SAP Calculation Printout



Dwelling Primary energy Rate (DPER)

57.8100 (287)

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

## 1. Overall dwelling characteristics

|                                                        | Area<br>(m <sup>2</sup> ) | Storey height<br>(m)              | Volume<br>(m <sup>3</sup> ) |
|--------------------------------------------------------|---------------------------|-----------------------------------|-----------------------------|
| Ground floor                                           | 67.8000 (1b)              | x 2.5000 (2b)                     | = 169.5000 (1b) -           |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 67.8000                   |                                   | (4)                         |
| 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                                                                | 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)  |

## 3. Heat losses and heat loss parameter

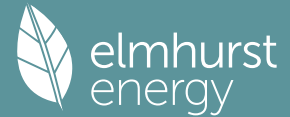
| Element                                                     | Gross<br>m <sup>2</sup> | Openings<br>m <sup>2</sup> | NetArea<br>m <sup>2</sup> | U-value<br>W/m <sup>2</sup> K | A x U<br>W/K | K-value<br>kJ/m <sup>2</sup> K | A x K<br>kJ/K |
|-------------------------------------------------------------|-------------------------|----------------------------|---------------------------|-------------------------------|--------------|--------------------------------|---------------|
| TER Opaque door                                             |                         |                            | 2.1000                    | 1.0000                        | 2.1000       |                                | (26)          |
| TER Opening Type (Uw = 1.20)                                |                         |                            | 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)         |
| lift/stair new                                              | 17.0000                 |                            | 17.0000                   | 0.1800                        | 3.0600       |                                | (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, m <sup>2</sup> ) |                         |                            | 170.3000                  |                               |              |                                | (31)          |
| Fabric heat loss, W/K = Sum (A x U)                         |                         |                            | (26)...(30) + (32) =      |                               | 41.9608      |                                | (33)          |
| pw                                                          |                         |                            | 10.7500                   | 0.0000                        | 0.0000       |                                | (32)          |

Thermal mass parameter (TMP = Cm / TFA) in kJ/m<sup>2</sup>K 104.2950 (35)

### List of Thermal Bridges

| K1 Element                                                       | Length  | Psi-value | Total        |
|------------------------------------------------------------------|---------|-----------|--------------|
| E2 Other lintels (including other steel lintels)                 | 8.8000  | 0.0500    | 0.4400       |
| E3 Sill                                                          | 7.8000  | 0.0500    | 0.3900       |
| E4 Jamb                                                          | 19.2000 | 0.0500    | 0.9600       |
| E7 Party floor between dwellings (in blocks of flats)            | 27.8000 | 0.0700    | 1.9460       |
| E14 Flat roof                                                    | 32.2000 | 0.0800    | 2.5760       |
| E15 Flat roof with parapet                                       | 13.4000 | 0.5600    | 7.5040       |
| E16 Corner (normal)                                              | 12.5000 | 0.0900    | 1.1250       |
| E17 Corner (inverted - internal area greater than external area) | 10.0000 | -0.0900   | -0.9000      |
| E18 Party wall between dwellings                                 | 5.0000  | 0.0600    | 0.3000       |
| E24 Eaves (insulation at ceiling level - inverted)               | 4.4000  | 0.2400    | 1.0560       |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)       |         |           | 15.3970 (36) |

# Full SAP Calculation Printout



Point Thermal bridges  
Total fabric heat loss (33) + (36) + (36a) = 0.0000  
57.3578 (37)

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

|                           | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec          |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| (38)m                     | 31.6654 | 31.5218 | 31.3811 | 30.7200 | 30.5963 | 30.0205 | 30.0205 | 29.9139 | 30.2423 | 30.5963 | 30.8465 | 31.1081 (38) |
| Heat transfer coeff       | 89.0233 | 88.8797 | 88.7389 | 88.0778 | 87.9541 | 87.3783 | 87.3783 | 87.2717 | 87.6001 | 87.9541 | 88.2043 | 88.4659 (39) |
| Average = Sum(39)m / 12 = |         |         |         |         |         |         |         |         |         |         |         | 88.0772      |

|               | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec         |
|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------------|
| HLP           | 1.3130 | 1.3109 | 1.3088 | 1.2991 | 1.2973 | 1.2888 | 1.2888 | 1.2872 | 1.2920 | 1.2973 | 1.3009 | 1.3048 (40) |
| HLP (average) |        |        |        |        |        |        |        |        |        |        |        | 1.2991      |
| 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 conte                           | 196.9851 | 173.3319 | 182.1130 | 155.4726 | 147.5116 | 129.4580 | 125.3349 | 132.3062 | 135.9481 | 155.7238 | 170.6069 | 194.2415 (45) |
| Energy content (annual)                |          |          |          |          |          |          |          |          |          |          |          | 1899.0336     |
| 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):  
 Temperature factor from Table 2b 1.3938 (48)  
 Enter (49) or (54) in (55) 0.5400 (49)  
 Total storage loss 0.7527 (55)

|                                                                 | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec            |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------|
| 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 (56)   |
| Primary 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 (57)   |
| Combi 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)   |
| Total heat required for water heating calculated for each month | 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)    |
| WWHRS                                                           | 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)  |
| PV diverter                                                     | -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) |
| 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 (63b)  |
| 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 (63c)   |
| Output from w/h                                                 | 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)   |

12Total per year (kWh/year) 218.6897 (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  
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)  
 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  

|                                                                                     | 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     | 96.9448  | 107.3317 | 96.9448  | 100.1763 | 96.9448  | 100.1763 | 96.9448  | 96.9448  | 100.1763 | 96.9448  | 100.1763 | 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 | 183.6325 (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                                                                         | 3.0000   | 3.0000   | 3.0000   | 3.0000   | 3.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 3.0000   | 3.0000   | 3.0000 (70)   |
| Losses e.g. evaporation (negative values) (Table 5)                                 | -87.6621 | -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 | 121.9001 | 116.0262 | 109.8865 | 106.1153 | 109.2308 | 112.8836 | 119.6963 | 128.8892 | 136.9102 (72) |
| Total internal gains                                                                | 486.0633 | 496.1726 | 476.3868 | 459.3340 | 436.7288 | 418.1325 | 402.6535 | 403.7755 | 415.6834 | 432.9591 | 458.8833 | 476.3608 (73) |

## 6. Solar gains

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

# Full SAP Calculation Printout



|                                                                                     |                           |           |           |          |          |          |          |          |          |          |          |                 |               |             |              |
|-------------------------------------------------------------------------------------|---------------------------|-----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------------|---------------|-------------|--------------|
| 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 | 779.8507 | 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                                                                                 | 22.0641                   | 22.0998   | 22.1348   | 22.3010  | 22.3324  | 22.4795  | 22.4795  | 22.5070  | 22.4226  | 22.3324  | 22.2690  | 22.2031         |               |             |              |
| alpha                                                                               | 2.4709                    | 2.4733    | 2.4757    | 2.4867   | 2.4888   | 2.4986   | 2.4986   | 2.5005   | 2.4948   | 2.4888   | 2.4846   | 2.4802          |               |             |              |
| util living area                                                                    | 0.9419                    | 0.9188    | 0.8793    | 0.7985   | 0.6819   | 0.5376   | 0.4163   | 0.4622   | 0.6592   | 0.8405   | 0.9191   | 0.9470 (86)     |               |             |              |
| MIT                                                                                 | 18.3385                   | 18.6640   | 19.1814   | 19.8584  | 20.4141  | 20.7728  | 20.9132  | 20.8850  | 20.6020  | 19.8712  | 18.9971  | 18.2802 (87)    |               |             |              |
| Th 2                                                                                | 19.8306                   | 19.8323   | 19.8339   | 19.8416  | 19.8430  | 19.8496  | 19.8496  | 19.8509  | 19.8471  | 19.8430  | 19.8401  | 19.8371 (88)    |               |             |              |
| util rest of house                                                                  | 0.9330                    | 0.9065    | 0.8608    | 0.7672   | 0.6317   | 0.4628   | 0.3197   | 0.3634   | 0.5888   | 0.8082   | 0.9048   | 0.9388 (89)     |               |             |              |
| MIT 2                                                                               | 16.7688                   | 17.1770   | 17.8221   | 18.6498  | 19.2954  | 19.6803  | 19.8047  | 19.7870  | 19.5219  | 18.6890  | 17.6079  | 16.6992 (90)    |               |             |              |
| Living area fraction                                                                | fLA = Living area / (4) = |           |           |          |          |          |          |          |          |          |          |                 |               | 0.4705 (91) |              |
| MIT                                                                                 | 17.5073                   | 17.8767   | 18.4616   | 19.2184  | 19.8217  | 20.1943  | 20.3262  | 20.3036  | 20.0301  | 19.2452  | 18.2615  | 17.4431 (92)    |               |             |              |
| Temperature adjustment                                                              |                           |           |           |          |          |          |          |          |          |          |          |                 |               | 0.0000      |              |
| adjusted MIT                                                                        | 17.5073                   | 17.8767   | 18.4616   | 19.2184  | 19.8217  | 20.1943  | 20.3262  | 20.3036  | 20.0301  | 19.2452  | 18.2615  | 17.4431 (93)    |               |             |              |
|                                                                                     |                           |           |           |          |          |          |          |          |          |          |          |                 |               |             |              |
| 8. Space heating requirement                                                        |                           |           |           |          |          |          |          |          |          |          |          |                 |               |             |              |
|                                                                                     |                           |           |           |          |          |          |          |          |          |          |          |                 |               |             |              |
|                                                                                     | Jan                       | Feb       | Mar       | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec             |               |             |              |
| Utilisation                                                                         | 0.9088                    | 0.8799    | 0.8338    | 0.7479   | 0.6307   | 0.4863   | 0.3611   | 0.4040   | 0.6010   | 0.7882   | 0.8793   | 0.9157 (94)     |               |             |              |
| Useful gains                                                                        | 510.3806                  | 565.8923  | 600.3863  | 615.0723 | 562.5221 | 432.5480 | 306.6274 | 315.0763 | 421.3897 | 478.8386 | 486.1055 | 493.2465 (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                                                                    | 1175.7582                 | 1153.3608 | 1061.4612 | 908.8259 | 714.3392 | 488.8235 | 325.5924 | 340.6756 | 519.4746 | 760.3815 | 984.4960 | 1171.5625 (97)  |               |             |              |
| Space heating kWh                                                                   | 495.0409                  | 394.7788  | 343.0397  | 211.5026 | 112.9519 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 209.4679 | 358.8411 | 504.6671 (98a)  |               |             |              |
| Space heating requirement - total per year (kWh/year)                               |                           |           |           |          |          |          |          |          |          |          |          |                 | 2630.2901     |             |              |
| 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                                                                   | 495.0409                  | 394.7788  | 343.0397  | 211.5026 | 112.9519 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 209.4679 | 358.8411 | 504.6671 (98c)  |               |             |              |
| Space heating requirement after solar contribution - total per year (kWh/year)      |                           |           |           |          |          |          |          |          |          |          |          |                 | 2630.2901     |             |              |
| Space heating per m2                                                                | (98c) / (4) =             |           |           |          |          |          |          |          |          |          |          |                 | 38.7948 (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                                                           | 495.0409                  | 394.7788  | 343.0397  | 211.5026 | 112.9519 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 209.4679 | 358.8411 | 504.6671 (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)                                            | 536.3390                  | 427.7127  | 371.6573  | 229.1470 | 122.3748 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 226.9425 | 388.7770 | 546.7682 (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                                                           | 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)   |               |             |              |
| Efficiency of water heater (217)m                                                   | 85.8611                   | 85.6528   | 85.2277   | 84.4325  | 83.1136  | 79.8000  | 79.8000  | 79.8000  | 79.8000  | 84.3816  | 85.4396  | 79.8000 (216)   |               |             |              |
| Fuel for water heating, kWh/month                                                   | 251.2308                  | 222.7233  | 238.0648  | 212.2310 | 209.5783 | 197.3754 | 195.4304 | 202.8971 | 204.7685 | 215.1289 | 224.8921 | 248.4676 (219)  |               |             |              |
| Space cooling fuel requirement (221)m                                               | 0.0000                    | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (221)    |               |             |              |
| Pumps and Fa                                                                        | 7.3041                    | 6.5973    | 7.3041    | 7.0685   | 7.3041   | 7.0685   | 7.3041   | 7.3041   | 7.0685   | 7.3041   | 7.0685   | 7.3041 (231)    |               |             |              |
| Lighting                                                                            | 20.1432                   | 16.1596   | 14.5500   | 10.6599  | 8.2340   | 6.7273   | 7.5114   | 9.7635   | 12.6819  | 16.6393  | 18.7941  | 20.7031 (232)   |               |             |              |
| Electricity generated by PVs (Appendix M) (negative quantity) (233a)m               | -31.8811                  | -45.0346  | -64.8730  | -73.1236 | -79.0283 | -73.8507 | -72.9506 | -68.7827 | -61.4509 | -51.5852 | -35.0852 | -27.5538 (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) |                           |           |           |          |          |          |          |          |          |          |          |                 |               |             |              |

# Full SAP Calculation Printout



|                                                                                                      |          |          |          |           |           |           |           |           |          |          |          |          |                  |
|------------------------------------------------------------------------------------------------------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|------------------|
| (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) | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (235c)           |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (235b)           |
| (233b)m                                                                                              | -17.7551 | -37.3779 | -74.3337 | -111.7002 | -147.7405 | -148.4429 | -146.6837 | -124.1687 | -90.9833 | -53.4599 | -23.7095 | -14.0374 | (233b)           |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                              | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (234b)           |
| (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)                  | 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)           |
| (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) | 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)           |
| (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                                                                   |          |          |          |           |           |           |           |           |          |          |          |          | 2849.7185 (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                                                                              |          |          |          |           |           |           |           |           |          |          |          |          | 2622.7882 (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                                                                                        |          |          |          |           |           |           |           |           |          |          |          |          | -1675.5924 (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                                                                  |          |          |          |           |           |           |           |           |          |          |          |          | 4045.4815 (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                 | 2849.7185          | 0.2100                        | 598.4409 (261)           |
| Total CO2 associated with community systems   |                    |                               | 0.0000 (373)             |
| Water heating (other fuel)                    | 2622.7882          | 0.2100                        | 550.7855 (264)           |
| Space and water heating                       |                    |                               | 1149.2264 (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          | -685.1997          | 0.1345                        | -92.1811                 |
| PV Unit electricity exported                  | -990.3927          | 0.1259                        | -124.6743                |
| Total                                         |                    |                               | -216.8554 (269)          |
| Total CO2, kg/year                            |                    |                               | 967.7637 (272)           |
| EPC Target Carbon Dioxide Emission Rate (TER) |                    |                               | 14.2700 (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               | 2849.7185          | 1.1300                              | 3220.1819 (275)            |
| Total CO2 associated with community systems |                    |                                     | 0.0000 (473)               |
| Water heating (other fuel)                  | 2622.7882          | 1.1300                              | 2963.7507 (278)            |
| Space and water heating                     |                    |                                     | 6183.9325 (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        | -685.1997          | 1.4972                              | -1025.8834                 |
| PV Unit electricity exported                | -990.3927          | 0.4621                              | -457.6401                  |
| Total                                       |                    |                                     | -1483.5235 (283)           |
| Total Primary energy kWh/year               |                    |                                     | 5079.8609 (286)            |
| Target Primary Energy Rate (TPER)           |                    |                                     | 74.9200 (287)              |