

# Full SAP Calculation Printout



|                                    |                                                               |               |         |                |            |
|------------------------------------|---------------------------------------------------------------|---------------|---------|----------------|------------|
| Plot Reference                     | UNIT 14                                                       |               |         | Issued on Date | 08/07/2026 |
| Assessment Reference               | 001                                                           | Plot Type Ref | UNIT 14 |                |            |
| Plot Address                       | UNIT 14, Stoney Wood Quarter, 34 The Fairway, LONDON, NW7 3HS |               |         | SAP Version    | 10.2       |
|                                    |                                                               |               |         |                |            |
| SAP Rating                         | 79 C                                                          | DER           | 4.84    | TER            | 18.05      |
| Environmental                      | 97 A                                                          | % DER < TER   |         |                | 73.19      |
| CO <sub>2</sub> Emissions (t/year) | 0.23                                                          | DFEE          | 42.72   | TFEE           | 45.41      |
| Compliance Check                   | See BREL                                                      | % DFEE < TFEE |         |                | 5.92       |
| % DPER < TPER                      | 46.91                                                         | DPER          | 51.55   | TPER           | 97.10      |
|                                    |                                                               |               |         |                |            |
| Assessor Details                   | Mr. Ondrej Gajdos                                             |               |         | Assessor ID    | W452-0001  |
| Client                             |                                                               |               |         |                |            |

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

## 1. Overall dwelling characteristics

|                                                        | Area<br>(m <sup>2</sup> ) | Storey height<br>(m)            | Volume<br>(m <sup>3</sup> ) |
|--------------------------------------------------------|---------------------------|---------------------------------|-----------------------------|
| Main dwelling                                          |                           |                                 |                             |
| Ground floor                                           | 51.6000 (1b)              | 2.7500 (2b)                     | 141.9000 (1b) - (3b)        |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 51.6000                   |                                 | (4)                         |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 141.9000 (5)                |

## 2. Ventilation rate

|                                                    | m <sup>3</sup> per hour |
|----------------------------------------------------|-------------------------|
| Number of open chimneys                            | 0 * 80 = 0.0000 (6a)    |
| Number of open flues                               | 0 * 20 = 0.0000 (6b)    |
| Number of chimneys / flues attached to closed fire | 0 * 10 = 0.0000 (6c)    |
| Number of flues attached to solid fuel boiler      | 0 * 20 = 0.0000 (6d)    |
| Number of flues attached to other heater           | 0 * 35 = 0.0000 (6e)    |
| Number of blocked chimneys                         | 0 * 20 = 0.0000 (6f)    |
| Number of intermittent extract fans                | 0 * 10 = 0.0000 (7a)    |
| Number of passive vents                            | 0 * 10 = 0.0000 (7b)    |
| Number of flueless gas fires                       | 0 * 40 = 0.0000 (7c)    |

|                                                                                                    |                |            |
|----------------------------------------------------------------------------------------------------|----------------|------------|
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = | 0.0000 / (5) = | 0.0000 (8) |
| Pressure test                                                                                      | Yes            |            |
| Pressure Test Method                                                                               | Blower Door    |            |
| Measured/design AP50                                                                               | 3.0000         | (17)       |
| Infiltration rate                                                                                  | 0.1500         | (18)       |
| Number of sides sheltered                                                                          | 3              | (19)       |

|                                                      |                             |             |
|------------------------------------------------------|-----------------------------|-------------|
| Shelter factor                                       | (20) = 1 - [0.075 x (19)] = | 0.7750 (20) |
| Infiltration rate adjusted to include shelter factor | (21) = (18) x (20) =        | 0.1162 (21) |

|                                                                                                         | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec           |
|---------------------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------------|
| Wind speed                                                                                              | 5.1000 | 5.0000 | 4.9000 | 4.4000 | 4.3000 | 3.8000 | 3.8000 | 3.7000 | 4.0000 | 4.3000 | 4.5000 | 4.7000 (22)   |
| Factor                                                                                                  | 1.2750 | 1.2500 | 1.2250 | 1.1000 | 1.0750 | 0.9500 | 0.9500 | 0.9250 | 1.0000 | 1.0750 | 1.1250 | 1.1750 (22a)  |
| Adj infilt rate                                                                                         | 0.1482 | 0.1453 | 0.1424 | 0.1279 | 0.1250 | 0.1104 | 0.1104 | 0.1075 | 0.1162 | 0.1250 | 0.1308 | 0.1366 (22b)  |
| Balanced mechanical ventilation with heat recovery                                                      |        |        |        |        |        |        |        |        |        |        |        |               |
| If mechanical ventilation                                                                               |        |        |        |        |        |        |        |        |        |        |        | 0.5000 (23a)  |
| If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) |        |        |        |        |        |        |        |        |        |        |        | 0.5000 (23b)  |
| If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =            |        |        |        |        |        |        |        |        |        |        |        | 81.0000 (23c) |
| Effective ac                                                                                            | 0.2432 | 0.2403 | 0.2374 | 0.2229 | 0.2200 | 0.2054 | 0.2054 | 0.2025 | 0.2112 | 0.2200 | 0.2258 | 0.2316 (25)   |

## 3. Heat losses and heat loss parameter

| Element                                                     | Gross<br>m <sup>2</sup> | Openings<br>m <sup>2</sup> | NetArea<br>m <sup>2</sup> | U-value<br>W/m <sup>2</sup> K | A x U<br>W/K | K-value<br>kJ/m <sup>2</sup> K | A x K<br>kJ/K   |
|-------------------------------------------------------------|-------------------------|----------------------------|---------------------------|-------------------------------|--------------|--------------------------------|-----------------|
| Main dwelling                                               |                         |                            |                           |                               |              |                                |                 |
| dl                                                          |                         |                            | 2.1000                    | 1.0000                        | 2.1000       |                                | (26)            |
| l                                                           |                         |                            | 22.6900                   | 0.7940                        | 18.0149      |                                | (27)            |
| exposed wall                                                | 45.1000                 | 22.6900                    | 22.4100                   | 0.1500                        | 3.3615       | 60.0000                        | 1344.5999 (29a) |
| corridor wall                                               | 19.2500                 | 2.1000                     | 17.1500                   | 0.2500                        | 4.2875       | 9.0000                         | 154.3500 (29a)  |
| flat roof                                                   | 51.6000                 |                            | 51.6000                   | 0.1000                        | 5.1600       | 9.0000                         | 464.4000 (30)   |
| Total net area of external elements Aum(A, m <sup>2</sup> ) |                         |                            | 115.9500                  |                               |              |                                | (31)            |
| Fabric heat loss, W/K = Sum (A x U)                         |                         |                            | (26)...(30) + (32) =      |                               | 32.9239      |                                | (33)            |
| Main dwelling                                               |                         |                            |                           |                               |              |                                |                 |
| pw                                                          |                         |                            | 21.7250                   | 0.0000                        | 0.0000       | 110.0000                       | 2389.7500 (32)  |
| pf                                                          |                         |                            | 51.6000                   |                               |              | 40.0000                        | 2063.9999 (32d) |
| iw                                                          |                         |                            | 118.2500                  |                               |              | 9.0000                         | 1064.2500 (32c) |

|                                                                |                                      |                |
|----------------------------------------------------------------|--------------------------------------|----------------|
| Heat capacity Cm = Sum(A x k)                                  | (28)...(30) + (32) + (32a)...(32e) = | 7481.3499 (34) |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K |                                      | 144.9874 (35)  |
| List of Thermal Bridges                                        |                                      |                |

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|                                                                                     |         |                       |              |
|-------------------------------------------------------------------------------------|---------|-----------------------|--------------|
| K1 Element                                                                          | Length  | Psi-value             | Total        |
| E2 Other lintels (including other steel lintels)                                    | 10.4500 | 0.0500                | 0.5225       |
| E3 Sill                                                                             | 9.4500  | 0.0500                | 0.4725       |
| E4 Jamb                                                                             | 26.1000 | 0.0500                | 1.3050       |
| E7 Party floor between dwellings (in blocks of flats)                               | 16.3000 | 0.0700                | 1.1410       |
| E9 Balcony between dwellings, wall insulation continuous                            | 1.5000  | 0.0200                | 0.0300       |
| E23 Balcony within or between dwellings, balcony support penetrates wall insulation | 5.5000  | 0.0200                | 0.1100       |
| E24 Eaves (insulation at ceiling level - inverted)                                  | 5.4000  | 0.0800                | 0.4320       |
| E14 Flat roof                                                                       | 7.1000  | 0.1600                | 1.1360       |
| E15 Flat roof with parapet                                                          | 16.3000 | 0.5600                | 9.1280       |
| E16 Corner (normal)                                                                 | 11.0000 | 0.0900                | 0.9900       |
| E17 Corner (inverted - internal area greater than external area)                    | 8.2500  | -0.0900               | -0.7425      |
| E18 Party wall between dwellings                                                    | 2.7500  | 0.0600                | 0.1650       |
| E25 Staggered party wall between dwellings                                          | 2.7500  | 0.0600                | 0.1650       |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)                          |         |                       | 14.8545 (36) |
| Point Thermal bridges                                                               |         | (36a) =               | 0.0000       |
| Total fabric heat loss                                                              |         | (33) + (36) + (36a) = | 47.7784 (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                                                 | 11.3892 | 11.2531 | 11.1170 | 10.4366 | 10.3005 | 9.6200  | 9.6200  | 9.4839  | 9.8922  | 10.3005 | 10.5727 | 10.8448 (38) |
| Average = Sum(39)m / 12 =                                           | 59.1676 | 59.0315 | 58.8954 | 58.2150 | 58.0789 | 57.3984 | 57.3984 | 57.2623 | 57.6706 | 58.0789 | 58.3511 | 58.6233 (39) |
|                                                                     | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec          |
| HLP                                                                 | 1.1467  | 1.1440  | 1.1414  | 1.1282  | 1.1256  | 1.1124  | 1.1124  | 1.1097  | 1.1176  | 1.1256  | 1.1308  | 1.1361 (40)  |
| HLP (average)                                                       |         |         |         |         |         |         |         |         |         |         |         | 1.1275       |
| Days in mont                                                        | 31      | 28      | 31      | 30      | 31      | 30      | 31      | 31      | 30      | 31      | 30      | 31           |

|                                                                 |          |          |          |          |          |          |          |          |          |          |          |                |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------|
| 4. Water heating energy requirements (kWh/year)                 |          |          |          |          |          |          |          |          |          |          |          |                |
| Assumed occupancy                                               |          |          |          |          |          |          |          |          |          |          |          | 1.7373 (42)    |
| Hot water usage for mixer showers                               | 53.3478  | 52.5461  | 51.3778  | 49.1426  | 47.4930  | 45.6535  | 44.6079  | 45.7673  | 47.0382  | 49.0133  | 51.2966  | 53.1434 (42a)  |
| Hot water usage for baths                                       | 23.0645  | 22.7220  | 22.2396  | 21.3502  | 20.6842  | 19.9458  | 19.5469  | 20.0259  | 20.5474  | 21.3376  | 22.2453  | 22.9866 (42b)  |
| Hot water usage for other uses                                  | 32.4214  | 31.2424  | 30.0635  | 28.8845  | 27.7055  | 26.5266  | 26.5266  | 27.7055  | 28.8845  | 30.0635  | 31.2424  | 32.4214 (42c)  |
| Average daily hot water use (litres/day)                        |          |          |          |          |          |          |          |          |          |          |          | 100.0433 (43)  |
| Daily hot water use                                             | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec            |
| Energy conte                                                    | 108.8337 | 106.5105 | 103.6809 | 99.3773  | 95.8828  | 92.1258  | 90.6814  | 93.4987  | 96.4701  | 100.4144 | 104.7844 | 108.5513 (44)  |
| Energy content (annual)                                         | 172.3660 | 151.6695 | 159.3537 | 136.0426 | 129.0767 | 113.2795 | 109.6712 | 115.7709 | 118.9573 | 136.2614 | 149.2845 | 169.9652 (45)  |
| Distribution loss (46)m = 0.15 x (45)m                          | 25.8549  | 22.7504  | 23.9031  | 20.4064  | 19.3615  | 16.9919  | 16.4507  | 17.3656  | 17.8436  | 20.4392  | 22.3927  | 25.4948 (46)   |
| Water storage loss (or HIU loss):                               |          |          |          |          |          |          |          |          |          |          |          | 110.0000 (47)  |
| Store volume                                                    |          |          |          |          |          |          |          |          |          |          |          |                |
| b) If manufacturer declared loss factor is not known :          |          |          |          |          |          |          |          |          |          |          |          |                |
| Hot water storage loss factor from Table 2 (kWh/litre/day)      |          |          |          |          |          |          |          |          |          |          |          | 0.0152 (51)    |
| Volume factor from Table 2a                                     |          |          |          |          |          |          |          |          |          |          |          | 1.0294 (52)    |
| Temperature factor from Table 2b                                |          |          |          |          |          |          |          |          |          |          |          | 0.6000 (53)    |
| Enter (49) or (54) in (55)                                      |          |          |          |          |          |          |          |          |          |          |          | 1.0327 (55)    |
| Total storage loss                                              | 32.0144  | 28.9162  | 32.0144  | 30.9817  | 32.0144  | 30.9817  | 32.0144  | 32.0144  | 30.9817  | 32.0144  | 30.9817  | 32.0144 (56)   |
| If cylinder contains dedicated solar storage                    | 32.0144  | 28.9162  | 32.0144  | 30.9817  | 32.0144  | 30.9817  | 32.0144  | 32.0144  | 30.9817  | 32.0144  | 30.9817  | 32.0144 (57)   |
| Primary loss                                                    | 23.2624  | 21.0112  | 23.2624  | 22.5120  | 23.2624  | 22.5120  | 23.2624  | 23.2624  | 22.5120  | 23.2624  | 22.5120  | 23.2624 (59)   |
| Combi loss                                                      | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (61)    |
| Total heat required for water heating calculated for each month | 227.6428 | 201.5970 | 214.6305 | 189.5363 | 184.3535 | 166.7732 | 164.9480 | 171.0477 | 172.4510 | 191.5382 | 202.7782 | 225.2420 (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                                                 | 227.6428 | 201.5970 | 214.6305 | 189.5363 | 184.3535 | 166.7732 | 164.9480 | 171.0477 | 172.4510 | 191.5382 | 202.7782 | 225.2420 (64)  |
| 12Total per year (kWh/year)                                     |          |          |          |          |          |          |          |          |          |          |          | 2312.5384 (64) |
| Electric shower(s)                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (64a)   |
| Heat gains from water heating, kWh/month                        | 101.5331 | 90.3721  | 97.2066  | 88.0291  | 87.1394  | 80.4604  | 80.6871  | 82.7153  | 82.3483  | 89.5284  | 92.4320  | 100.7349 (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                                                                               | 86.8635  | 86.8635  | 86.8635  | 86.8635  | 86.8635  | 86.8635  | 86.8635  | 86.8635  | 86.8635  | 86.8635  | 86.8635  | 86.8635 (66)  |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 76.3580  | 84.5392  | 76.3580  | 78.9032  | 76.3580  | 78.9032  | 76.3580  | 76.3580  | 78.9032  | 76.3580  | 78.9032  | 76.3580 (67)  |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 151.3882 | 152.9591 | 149.0004 | 140.5728 | 129.9344 | 119.9359 | 113.2562 | 111.6853 | 115.6440 | 124.0716 | 134.7100 | 144.7085 (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863 (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)                                 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 (71) |
| Water heating gains (Table 5)                                                       | 136.4693 | 134.4822 | 130.6540 | 122.2626 | 117.1229 | 111.7505 | 108.4504 | 111.1765 | 114.3726 | 120.3338 | 128.3778 | 135.3963 (72) |
| Total internal gains                                                                | 413.2745 | 421.0396 | 405.0714 | 390.7977 | 372.4744 | 359.6487 | 347.1237 | 348.2788 | 357.9789 | 369.8224 | 391.0501 | 405.5219 (73) |

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

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|                                                                                         |          |          |          |          |           |           |          |          |          |               |               |                 |
|-----------------------------------------------------------------------------------------|----------|----------|----------|----------|-----------|-----------|----------|----------|----------|---------------|---------------|-----------------|
| Northeast                                                                               | 5.2500   |          | 11.2829  |          | 0.5300    |           | 0.7000   |          | 0.7700   |               | 15.2296 (75)  |                 |
| Southeast                                                                               | 17.4400  |          | 36.7938  |          | 0.5300    |           | 0.7000   |          | 0.7700   |               | 164.9790 (77) |                 |
| Solar gains                                                                             | 180.2086 | 312.0206 | 440.3568 | 568.1455 | 656.9273  | 661.2191  | 633.7227 | 566.1051 | 484.3941 | 348.4721      | 216.7696      | 153.6249 (83)   |
| Total gains                                                                             | 593.4830 | 733.0601 | 845.4282 | 958.9432 | 1029.4016 | 1020.8677 | 980.8464 | 914.3839 | 842.3729 | 718.2945      | 607.8197      | 559.1467 (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                                                                                     | 35.1231  | 35.2041  | 35.2855  | 35.6979  | 35.7816   | 36.2057   | 36.2057  | 36.2918  | 36.0349  | 35.7816       | 35.6146       | 35.4493         |
| alpha                                                                                   | 3.3415   | 3.3469   | 3.3524   | 3.3799   | 3.3854    | 3.4137    | 3.4137   | 3.4195   | 3.4023   | 3.3854        | 3.3743        | 3.3633          |
| util living area                                                                        | 0.9184   | 0.8583   | 0.7741   | 0.6418   | 0.4948    | 0.3527    | 0.2556   | 0.2851   | 0.4522   | 0.7011        | 0.8679        | 0.9297 (86)     |
| MIT                                                                                     | 19.6207  | 19.9992  | 20.3779  | 20.7217  | 20.9037   | 20.9772   | 20.9942  | 20.9916  | 20.9467  | 20.6856       | 20.1135       | 19.5480 (87)    |
| Th 2                                                                                    | 19.9629  | 19.9650  | 19.9672  | 19.9779  | 19.9800   | 19.9907   | 19.9907  | 19.9929  | 19.9864  | 19.9800       | 19.9757       | 19.9715 (88)    |
| util rest of house                                                                      | 0.9052   | 0.8381   | 0.7451   | 0.6026   | 0.4475    | 0.2995    | 0.1978   | 0.2239   | 0.3919   | 0.6562        | 0.8454        | 0.9180 (89)     |
| MIT 2                                                                                   | 18.4069  | 18.8658  | 19.3141  | 19.7087  | 19.8989   | 19.9759   | 19.9882  | 19.9890  | 19.9487  | 19.6849       | 19.0231       | 18.3239 (90)    |
| Living area fraction                                                                    | 18.7739  | 19.2085  | 19.6357  | 20.0149  | 20.2027   | 20.2786   | 20.2924  | 20.2921  | 20.2504  | 19.9874       | 19.3527       | 18.6940 (93)    |
| MIT                                                                                     | 18.7739  | 19.2085  | 19.6357  | 20.0149  | 20.2027   | 20.2786   | 20.2924  | 20.2921  | 20.2504  | 19.9874       | 19.3527       | 18.6940 (93)    |
| Temperature adjustment                                                                  |          |          |          |          |           |           |          |          |          |               |               | 0.0000          |
| adjusted MIT                                                                            | 18.7739  | 19.2085  | 19.6357  | 20.0149  | 20.2027   | 20.2786   | 20.2924  | 20.2921  | 20.2504  | 19.9874       | 19.3527       | 18.6940 (93)    |
| 8. Space heating requirement                                                            |          |          |          |          |           |           |          |          |          |               |               |                 |
|                                                                                         | Jan      | Feb      | Mar      | Apr      | May       | Jun       | Jul      | Aug      | Sep      | Oct           | Nov           | Dec             |
| Utilisation                                                                             | 0.8868   | 0.8212   | 0.7350   | 0.6041   | 0.4581    | 0.3148    | 0.2152   | 0.2423   | 0.4079   | 0.6565        | 0.8296        | 0.9002 (94)     |
| Useful gains                                                                            | 526.3136 | 601.9929 | 621.3501 | 579.2766 | 471.5662  | 321.4109  | 211.0460 | 221.5174 | 343.6278 | 471.5722      | 504.2345      | 503.3593 (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                                                                        | 856.3837 | 844.6509 | 773.6343 | 647.0563 | 493.8249  | 325.9432  | 211.9362 | 222.8700 | 354.6982 | 545.2103      | 714.9602      | 849.6838 (97)   |
| Space heating kWh                                                                       | 245.5721 | 163.0661 | 113.2995 | 48.8014  | 16.5605   | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 54.7868       | 151.7225      | 257.6654 (98a)  |
| Space heating requirement - total per year (kWh/year)                                   |          |          |          |          |           |           |          |          |          |               |               | 1051.4743       |
| 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                                                                       | 245.5721 | 163.0661 | 113.2995 | 48.8014  | 16.5605   | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 54.7868       | 151.7225      | 257.6654 (98c)  |
| Space heating requirement after solar contribution - total per year (kWh/year)          |          |          |          |          |           |           |          |          |          |               |               | 1051.4743       |
| Space heating per m2                                                                    |          |          |          |          |           |           |          |          |          | (98c) / (4) = |               | 20.3774 (99)    |
| 9b. Energy requirements                                                                 |          |          |          |          |           |           |          |          |          |               |               |                 |
| Fraction of space heat from secondary/supplementary system (Table 11)                   |          |          |          |          |           |           |          |          |          |               |               | 0.0000 (301)    |
| Fraction of space heat from community system                                            |          |          |          |          |           |           |          |          |          |               |               | 1.0000 (302)    |
| Fraction of heat from community Heat pump-Space and Water                               |          |          |          |          |           |           |          |          |          |               |               | 1.0000 (303a)   |
| Factor for control and charging method (Table 4c(3)) for space heating                  |          |          |          |          |           |           |          |          |          |               |               | 1.0000 (305)    |
| Factor for charging method (Table 4c(3)) for water heating                              |          |          |          |          |           |           |          |          |          |               |               | 1.0000 (305a)   |
| Distribution loss factor (Table 12c) for community heating system                       |          |          |          |          |           |           |          |          |          |               |               | 1.5000 (306)    |
| Efficiency of secondary/supplementary heating system, %                                 |          |          |          |          |           |           |          |          |          |               |               | 0.0000 (208)    |
| Space heating:                                                                          |          |          |          |          |           |           |          |          |          |               |               |                 |
| Space heating requirement                                                               |          |          |          |          |           |           |          |          |          |               |               |                 |
|                                                                                         | 245.5721 | 163.0661 | 113.2995 | 48.8014  | 16.5605   | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 54.7868       | 151.7225      | 257.6654 (98)   |
| Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50                                   |          |          |          |          |           |           |          |          |          |               |               |                 |
| 307a                                                                                    | 368.3582 | 244.5992 | 169.9492 | 73.2021  | 24.8407   | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 82.1802       | 227.5837      | 386.4981        |
| Space heating requirement                                                               |          |          |          |          |           |           |          |          |          |               |               |                 |
|                                                                                         | 368.3582 | 244.5992 | 169.9492 | 73.2021  | 24.8407   | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 82.1802       | 227.5837      | 386.4981 (307)  |
| Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) |          |          |          |          |           |           |          |          |          |               |               | 0.0000 (308)    |
| Space heating fuel for secondary/supplementary system                                   |          |          |          |          |           |           |          |          |          |               |               |                 |
|                                                                                         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000        | 0.0000        | 0.0000 (309)    |
| Water heating                                                                           |          |          |          |          |           |           |          |          |          |               |               |                 |
| Annual water heating requirement                                                        |          |          |          |          |           |           |          |          |          |               |               |                 |
|                                                                                         | 227.6428 | 201.5970 | 214.6305 | 189.5363 | 184.3535  | 166.7732  | 164.9480 | 171.0477 | 172.4510 | 191.5382      | 202.7782      | 225.2420 (64)   |
| Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50                                   |          |          |          |          |           |           |          |          |          |               |               |                 |
| 310a                                                                                    | 341.4642 | 302.3955 | 321.9458 | 284.3044 | 276.5303  | 250.1597  | 247.4221 | 256.5716 | 258.6765 | 287.3073      | 304.1673      | 337.8630        |
| Water heating fuel                                                                      |          |          |          |          |           |           |          |          |          |               |               |                 |
|                                                                                         | 341.4642 | 302.3955 | 321.9458 | 284.3044 | 276.5303  | 250.1597  | 247.4221 | 256.5716 | 258.6765 | 287.3073      | 304.1673      | 337.8630 (310)  |
| Cooling System Energy Efficiency Ratio                                                  |          |          |          |          |           |           |          |          |          |               |               | 0.0000 (314)    |
| Space coolin                                                                            | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000        | 0.0000        | 0.0000 (315)    |
| Pumps and Fa                                                                            | 10.1893  | 9.2032   | 10.1893  | 9.8606   | 10.1893   | 9.8606    | 10.1893  | 10.1893  | 9.8606   | 10.1893       | 9.8606        | 10.1893 (331)   |
| Lighting                                                                                | 15.8657  | 12.7280  | 11.4602  | 8.3962   | 6.4855    | 5.2987    | 5.9163   | 7.6902   | 9.9888   | 13.1059       | 14.8030       | 16.3066 (332)   |
| Electricity generated by PVs (Appendix M) (negative quantity)                           |          |          |          |          |           |           |          |          |          |               |               |                 |
| (333a)m                                                                                 | -2.2265  | -3.9806  | -7.4054  | -10.5198 | -13.2484  | -13.1047  | -12.8263 | -10.9865 | -8.1962  | -5.2153       | -2.6813       | -1.8152 (333a)  |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                 |          |          |          |          |           |           |          |          |          |               |               |                 |
| (334a)m                                                                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000        | 0.0000        | 0.0000 (334a)   |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)     |          |          |          |          |           |           |          |          |          |               |               |                 |
| (335a)m                                                                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000        | 0.0000        | 0.0000 (335a)   |
| Electricity generated by PVs (Appendix M) (negative quantity)                           |          |          |          |          |           |           |          |          |          |               |               |                 |
| (333b)m                                                                                 | -0.2495  | -0.6642  | -1.7369  | -3.3042  | -5.0361   | -5.3273   | -5.1725  | -3.9649  | -2.4022  | -1.0701       | -0.3599       | -0.1847 (333b)  |
| Electricity generated by wind turbines (Appendix M) (negative quantity)                 |          |          |          |          |           |           |          |          |          |               |               |                 |
| (334b)m                                                                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000        | 0.0000        | 0.0000 (334b)   |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)     |          |          |          |          |           |           |          |          |          |               |               |                 |
| (335b)m                                                                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | 0.0000    | 0.0000   | 0.0000   | 0.0000   | 0.0000        | 0.0000        | 0.0000 (335b)   |
| Annual totals kWh/year                                                                  |          |          |          |          |           |           |          |          |          |               |               |                 |
| Space heating fuel - community heating                                                  |          |          |          |          |           |           |          |          |          |               |               | 1577.2115 (307) |
| Space heating fuel - secondary                                                          |          |          |          |          |           |           |          |          |          |               |               | 0.0000 (309)    |
| Water heating fuel - community heating                                                  |          |          |          |          |           |           |          |          |          |               |               | 3468.8076 (310) |
| Efficiency of water heater                                                              |          |          |          |          |           |           |          |          |          |               |               | 0.0000 (311)    |
| Electricity used for heat distribution                                                  |          |          |          |          |           |           |          |          |          |               |               | 15.7721 (313)   |
| Space cooling fuel                                                                      |          |          |          |          |           |           |          |          |          |               |               | 0.0000 (321)    |
| Electricity for pumps and fans:                                                         |          |          |          |          |           |           |          |          |          |               |               |                 |
| (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6930)              |          |          |          |          |           |           |          |          |          |               |               |                 |
| mechanical ventilation fans (SFP = 0.6930)                                              |          |          |          |          |           |           |          |          |          |               |               | 119.9708 (330a) |
| Total electricity for the above, kWh/year                                               |          |          |          |          |           |           |          |          |          |               |               | 119.9708 (331)  |

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|                                                               |                 |
|---------------------------------------------------------------|-----------------|
| Electricity for lighting (calculated in Appendix L)           | 128.0451 (332)  |
| Energy saving/generation technologies (Appendices M ,N and Q) |                 |
| PV generation                                                 | -121.6788 (333) |
| Wind generation                                               | 0.0000 (334)    |
| Hydro-electric generation (Appendix N)                        | 0.0000 (335a)   |
| Electricity generated - Micro CHP (Appendix N)                | 0.0000 (335)    |
| Appendix Q - special features                                 |                 |
| Energy saved or generated                                     | -0.0000 (336)   |
| Energy used                                                   | 0.0000 (337)    |
| Total delivered energy for all uses                           | 5172.3561 (338) |

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

|                                                         | Energy<br>kWh/year | Emission factor<br>kg CO2/kWh | Emissions<br>kg CO2/year |
|---------------------------------------------------------|--------------------|-------------------------------|--------------------------|
| Efficiency of heat source Heat pump                     |                    |                               | 330.0000 (367)           |
| Space and Water heating from Heat pump                  | 1529.0967          | 0.1569                        | 74.9904 (367)            |
| Electrical energy for heat distribution (space & water) | 15.7721            | 0.0000                        | 7.3578 (372)             |
| Overall CO2 factor for heat network                     |                    |                               | 0.0456 (386)             |
| Total CO2 associated with community systems             |                    |                               | 230.3207 (373)           |
| Space and water heating                                 |                    |                               | 230.3207 (376)           |
| Pumps, fans and electric keep-hot                       | 119.9708           | 0.1387                        | 16.6414 (378)            |
| Energy for lighting                                     | 128.0451           | 0.1443                        | 18.4809 (379)            |
| Energy saving/generation technologies                   |                    |                               |                          |
| PV Unit electricity used in dwelling                    | -92.2063           | 0.1304                        | -12.0227                 |
| PV Unit electricity exported                            | -29.4725           | 0.1205                        | -3.5527                  |
| Total                                                   |                    |                               | -15.5754 (380)           |
| Total CO2, kg/year                                      |                    |                               | 249.8676 (383)           |
| EPC Dwelling Carbon Dioxide Emission Rate (DER)         |                    |                               | 4.8400 (384)             |

## 13b. Primary energy - Community heating scheme

|                                                         | Energy<br>kWh/year | Primary energy factor<br>kg CO2/kWh | Primary energy<br>kWh/year |
|---------------------------------------------------------|--------------------|-------------------------------------|----------------------------|
| Efficiency of heat source Heat pump                     |                    |                                     | 330.0000 (467a)            |
| Space and Water heating from Heat pump                  | 1529.0967          | 1.5808                              | 755.5429 (467)             |
| Electrical energy for heat distribution (space & water) | 15.7721            | 0.0000                              | 77.6767 (472)              |
| Overall CO2 factor for heat network                     |                    |                                     | 0.4819 (486)               |
| Total CO2 associated with community systems             |                    |                                     | 2431.5157 (473)            |
| Space and water heating                                 |                    |                                     | 2431.5157 (476)            |
| Pumps, fans and electric keep-hot                       | 119.9708           | 1.5128                              | 181.4918 (478)             |
| Energy for lighting                                     | 128.0451           | 1.5338                              | 196.3998 (479)             |
| Energy saving/generation technologies                   |                    |                                     |                            |
| PV Unit electricity used in dwelling                    | -92.2063           | 1.4817                              | -136.6175                  |
| PV Unit electricity exported                            | -29.4725           | 0.4422                              | -13.0325                   |
| Total                                                   |                    |                                     | -149.6500 (480)            |
| Total Primary energy kWh/year                           |                    |                                     | 2659.7573 (483)            |
| Dwelling Primary energy Rate (DPER)                     |                    |                                     | 51.5500 (484)              |

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

## 1. Overall dwelling characteristics

|                                                        | Area<br>(m2) | Storey height<br>(m)            | Volume<br>(m3)       |
|--------------------------------------------------------|--------------|---------------------------------|----------------------|
| Main dwelling                                          | 51.6000 (1b) | 2.7500 (2b)                     | 141.9000 (1b) - (3b) |
| Ground floor                                           |              |                                 |                      |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 51.6000      |                                 | 141.9000 (4)         |
| Dwelling volume                                        |              | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 141.9000 (5)         |

## 2. Ventilation rate

|                                                                                                  | m3 per hour                             |
|--------------------------------------------------------------------------------------------------|-----------------------------------------|
| Number of open chimneys                                                                          | 0 * 80 = 0.0000 (6a)                    |
| Number of open flues                                                                             | 0 * 20 = 0.0000 (6b)                    |
| Number of chimneys / flues attached to closed fire                                               | 0 * 10 = 0.0000 (6c)                    |
| Number of flues attached to solid fuel boiler                                                    | 0 * 20 = 0.0000 (6d)                    |
| Number of flues attached to other heater                                                         | 0 * 35 = 0.0000 (6e)                    |
| Number of blocked chimneys                                                                       | 0 * 20 = 0.0000 (6f)                    |
| Number of intermittent extract fans                                                              | 2 * 10 = 20.0000 (7a)                   |
| Number of passive vents                                                                          | 0 * 10 = 0.0000 (7b)                    |
| Number of flueless gas fires                                                                     | 0 * 40 = 0.0000 (7c)                    |
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) | 20.0000 / (5) = 0.1409 (8)              |
| Pressure test                                                                                    | Yes                                     |
| Pressure Test Method                                                                             | Blower Door                             |
| Measured/design AP50                                                                             | 5.0000 (17)                             |
| Infiltration rate                                                                                | 0.3909 (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) = 0.3030 (21)        |

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

# Full SAP Calculation Printout



|                 |        |        |        |        |        |        |        |        |        |        |        |              |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------------|
| 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 |        |        |        |        |        |        |        |        |        |        |        |              |
| Effective ac    | 0.3863 | 0.3787 | 0.3712 | 0.3333 | 0.3257 | 0.2878 | 0.2878 | 0.2803 | 0.3030 | 0.3257 | 0.3409 | 0.3560 (22b) |
|                 | 0.5746 | 0.5717 | 0.5689 | 0.5555 | 0.5530 | 0.5414 | 0.5414 | 0.5393 | 0.5459 | 0.5530 | 0.5581 | 0.5634 (25)  |

## 3. Heat losses and heat loss parameter

| Element                                        | Gross<br>m2 | Openings<br>m2 | NetArea<br>m2 | U-value<br>W/m2K | A x U<br>W/K         | K-value<br>kJ/m2K | A x K<br>kJ/K |
|------------------------------------------------|-------------|----------------|---------------|------------------|----------------------|-------------------|---------------|
| Main dwelling                                  |             |                |               |                  |                      |                   |               |
| TER Opaque door                                |             |                | 2.1000        | 1.0000           | 2.1000               |                   | (26)          |
| TER Opening Type                               |             |                | 10.8000       | 1.1450           | 12.3664              |                   | (27)          |
| exposed wall                                   | 45.1000     | 10.8000        | 34.3000       | 0.1800           | 6.1740               |                   | (29a)         |
| corridor wall                                  | 19.2500     | 2.1000         | 17.1500       | 0.1800           | 3.0870               |                   | (29a)         |
| flat roof                                      | 51.6000     |                | 51.6000       | 0.1100           | 5.6760               |                   | (30)          |
| Total net area of external elements Aum(A, m2) |             |                | 115.9500      |                  |                      |                   | (31)          |
| Fabric heat loss, W/K = Sum (A x U)            |             |                |               |                  | (26)...(30) + (32) = | 29.4034           | (33)          |
| Main dwelling                                  |             |                |               |                  |                      |                   |               |
| pw                                             |             |                | 21.7250       | 0.0000           | 0.0000               |                   | (32)          |

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

List of Thermal Bridges 144.9874 (35)

| K1 Element                                                                          | Length  | Psi-value | Total   |
|-------------------------------------------------------------------------------------|---------|-----------|---------|
| E2 Other lintels (including other steel lintels)                                    | 10.4500 | 0.0500    | 0.5225  |
| E3 Sill                                                                             | 9.4500  | 0.0500    | 0.4725  |
| E4 Jamb                                                                             | 26.1000 | 0.0500    | 1.3050  |
| E7 Party floor between dwellings (in blocks of flats)                               | 16.3000 | 0.0700    | 1.1410  |
| E9 Balcony between dwellings, wall insulation continuous                            | 1.5000  | 0.0200    | 0.0300  |
| E23 Balcony within or between dwellings, balcony support penetrates wall insulation | 5.5000  | 0.0200    | 0.1100  |
| E24 Eaves (insulation at ceiling level - inverted)                                  | 5.4000  | 0.2400    | 1.2960  |
| E14 Flat roof                                                                       | 7.1000  | 0.0800    | 0.5680  |
| E15 Flat roof with parapet                                                          | 16.3000 | 0.5600    | 9.1280  |
| E16 Corner (normal)                                                                 | 11.0000 | 0.0900    | 0.9900  |
| E17 Corner (inverted - internal area greater than external area)                    | 8.2500  | -0.0900   | -0.7425 |
| E18 Party wall between dwellings                                                    | 2.7500  | 0.0600    | 0.1650  |
| E25 Staggered party wall between dwellings                                          | 2.7500  | 0.0600    | 0.1650  |

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.1505 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 44.5539 (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       | 26.9075 | 26.7718 | 26.6388 | 26.0142 | 25.8973 | 25.3533 | 25.3533 | 25.2525 | 25.5628 | 25.8973 | 26.1337 | 26.3809 (38) |
| Average = Sum(39)m / 12 = | 71.4614 | 71.3257 | 71.1927 | 70.5681 | 70.4512 | 69.9072 | 69.9072 | 69.8064 | 70.1167 | 70.4512 | 70.6876 | 70.9348 (39) |
|                           |         |         |         |         |         |         |         |         |         |         |         | 70.5675      |

| HLP           | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec         |
|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------------|
| HLP (average) | 1.3849 | 1.3823 | 1.3797 | 1.3676 | 1.3653 | 1.3548 | 1.3548 | 1.3528 | 1.3589 | 1.3653 | 1.3699 | 1.3747 (40) |
| Days in mont  | 31     | 28     | 31     | 30     | 31     | 30     | 31     | 31     | 30     | 31     | 30     | 31          |

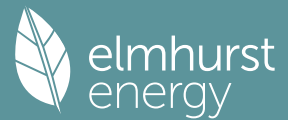
## 4. Water heating energy requirements (kWh/year)

|                                                                 |          |          |          |          |          |          |          |          |          |                                                                                |               |                |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--------------------------------------------------------------------------------|---------------|----------------|
| Assumed occupancy                                               |          |          |          |          |          |          |          |          |          |                                                                                |               | 1.7373 (42)    |
| Hot water usage for mixer showers                               |          |          |          |          |          |          |          |          |          |                                                                                |               |                |
| 53.3478                                                         | 52.5461  | 51.3778  | 49.1426  | 47.4930  | 45.6535  | 44.6079  | 45.7673  | 47.0382  | 49.0133  | 51.2966                                                                        | 53.1434 (42a) |                |
| Hot water usage for baths                                       |          |          |          |          |          |          |          |          |          |                                                                                |               |                |
| 23.0645                                                         | 22.7220  | 22.2396  | 21.3502  | 20.6842  | 19.9458  | 19.5469  | 20.0259  | 20.5474  | 21.3376  | 22.2453                                                                        | 22.9866 (42b) |                |
| Hot water usage for other uses                                  |          |          |          |          |          |          |          |          |          |                                                                                |               |                |
| 32.4214                                                         | 31.2424  | 30.0635  | 28.8845  | 27.7055  | 26.5266  | 26.5266  | 27.7055  | 28.8845  | 30.0635  | 31.2424                                                                        | 32.4214 (42c) |                |
| Average daily hot water use (litres/day)                        |          |          |          |          |          |          |          |          |          |                                                                                |               | 100.0433 (43)  |
| Daily hot water use                                             | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct                                                                            | Nov           | Dec            |
| 108.8337                                                        | 106.5105 | 103.6809 | 99.3773  | 95.8828  | 92.1258  | 90.6814  | 93.4987  | 96.4701  | 100.4144 | 104.7844                                                                       | 108.5513 (44) |                |
| Energy content (annual)                                         | 172.3660 | 151.6695 | 159.3537 | 136.0426 | 129.0767 | 113.2795 | 109.6712 | 115.7709 | 118.9573 | 136.2614                                                                       | 149.2845      | 169.9652 (45)  |
| Distribution loss (46)m = 0.15 x (45)m                          |          |          |          |          |          |          |          |          |          | Total = Sum(45)m =                                                             |               | 1661.6986      |
| 25.8549                                                         | 22.7504  | 23.9031  | 20.4064  | 19.3615  | 16.9919  | 16.4507  | 17.3656  | 17.8436  | 20.4392  | 22.3927                                                                        | 25.4948 (46)  |                |
| Water storage loss (or HIU loss):                               |          |          |          |          |          |          |          |          |          |                                                                                |               |                |
| Total storage loss                                              | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                                                         | 0.0000        | 0.0000 (56)    |
| If cylinder contains dedicated solar storage                    |          |          |          |          |          |          |          |          |          |                                                                                |               |                |
| 0.0000                                                          | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                                                         | 0.0000 (57)   |                |
| Primary loss                                                    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                                                         | 0.0000        | 0.0000 (59)    |
| Combi loss                                                      | 50.9589  | 46.0274  | 50.9589  | 49.0080  | 48.8608  | 45.4319  | 46.2102  | 47.6459  | 47.5743  | 50.9589                                                                        | 49.3151       | 50.9589 (61)   |
| Total heat required for water heating calculated for each month |          |          |          |          |          |          |          |          |          |                                                                                |               |                |
| 223.3249                                                        | 197.6969 | 210.3126 | 185.0506 | 177.9376 | 158.7114 | 155.8815 | 163.4169 | 166.5317 | 187.2203 | 198.5996                                                                       | 220.9241 (62) |                |
| WWHRS                                                           | -24.3884 | -21.5693 | -22.5861 | -18.7022 | -17.4298 | -14.9148 | -13.9802 | -14.8666 | -15.4314 | -18.1919                                                                       | -20.6092      | -23.9368 (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                                                 | 198.9365 | 176.1276 | 187.7265 | 166.3484 | 160.5078 | 143.7966 | 141.9012 | 148.5503 | 151.1002 | 169.0284                                                                       | 177.9903      | 196.9873 (64)  |
| 12Total per year (kWh/year)                                     |          |          |          |          |          |          |          |          |          | Total per year (kWh/year) = Sum(64)m =                                         |               | 2019.0012 (64) |
| Electric shower(s)                                              |          |          |          |          |          |          |          |          |          |                                                                                |               | 2019 (64)      |
| 0.0000                                                          | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000                                                                         | 0.0000        | 0.0000 (64a)   |
|                                                                 |          |          |          |          |          |          |          |          |          | Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = |               | 0.0000 (64a)   |
| Heat gains from water heating, kWh/month                        |          |          |          |          |          |          |          |          |          |                                                                                |               |                |
| 70.0514                                                         | 61.9370  | 65.7248  | 57.4862  | 55.1332  | 49.0234  | 48.0182  | 50.4053  | 51.4469  | 58.0466  | 61.9659                                                                        | 69.2531 (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                                                                               | 86.8635 | 86.8635 | 86.8635 | 86.8635 | 86.8635 | 86.8635 | 86.8635 | 86.8635 | 86.8635 | 86.8635 | 86.8635 | 86.8635 (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     |         |         |         |         |         |         |         |         |         |         |         |              |
|                                                                                     | 76.5856 | 84.7912 | 76.5856 | 79.1384 | 76.5856 | 79.1384 | 76.5856 | 76.5856 | 79.1384 | 76.5856 | 79.1384 | 76.5856 (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 |         |         |         |         |         |         |         |         |         |         |         |              |

# Full SAP Calculation Printout



|                               |          |          |          |          |          |          |          |          |          |          |          |               |
|-------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| Cooking gains                 | 151.3882 | 152.9591 | 149.0004 | 140.5728 | 129.9344 | 119.9359 | 113.2562 | 111.6853 | 115.6440 | 124.0716 | 134.7100 | 144.7085 (68) |
| Pumps, fans                   | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863  | 31.6863 (69)  |
| Losses e.g. evaporation       | 3.0000   | 3.0000   | 3.0000   | 3.0000   | 3.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 3.0000   | 3.0000   | 3.0000 (70)   |
| (negative values) (Table 5)   |          |          |          |          |          |          |          |          |          |          |          |               |
| -69.4908                      | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 | -69.4908 (71) |
| Water heating gains (Table 5) |          |          |          |          |          |          |          |          |          |          |          |               |
| 94.1551                       | 92.1681  | 88.3398  | 79.8419  | 74.1038  | 68.0881  | 64.5406  | 67.7491  | 71.4540  | 78.0197  | 86.0637  | 93.0822  | (72)          |
| Total internal gains          | 374.1879 | 381.9775 | 365.9849 | 351.6122 | 332.6829 | 316.2214 | 303.4415 | 305.0790 | 315.2955 | 330.7359 | 351.9712 | 366.4353 (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    |
|-------------|----------|----------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|----------|----------|------------------------------|--|--|---------------|
| Northeast   |          |          |          |          | 2.5000     | 11.2829                        | 0.6300                            | 0.7000                             |          |          | 0.7700                       |  |  | 8.6205 (75)   |
| Southeast   |          |          |          |          | 8.3000     | 36.7938                        | 0.6300                            | 0.7000                             |          |          | 0.7700                       |  |  | 93.3308 (77)  |
|             |          |          |          |          |            |                                |                                   |                                    |          |          |                              |  |  |               |
| Solar gains | 101.9513 | 176.5242 | 249.1338 | 321.4372 | 371.6725   | 374.1030                       | 358.5452                          | 320.2850                           | 274.0502 | 197.1476 | 122.6356                     |  |  | 86.9117 (83)  |
| Total gains | 476.1393 | 558.5017 | 615.1187 | 673.0493 | 704.3553   | 690.3245                       | 661.9867                          | 625.3640                           | 589.3457 | 527.8835 | 474.6068                     |  |  | 453.3470 (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                                                                         | 29.0808 | 29.1361 | 29.1905 | 29.4489 | 29.4978 | 29.7273 | 29.7273 | 29.7702 | 29.6385 | 29.4978 | 29.3991 | 29.2967      |
| alpha                                                                       | 2.9387  | 2.9424  | 2.9460  | 2.9633  | 2.9665  | 2.9818  | 2.9818  | 2.9759  | 2.9665  | 2.9599  | 2.9531  |              |
| util living area                                                            | 0.9585  | 0.9346  | 0.8990  | 0.8287  | 0.7202  | 0.5720  | 0.4381  | 0.4767  | 0.6706  | 0.8547  | 0.9365  | 0.9635 (86)  |
| MIT                                                                         | 18.8457 | 19.1679 | 19.5971 | 20.1305 | 20.5655 | 20.8452 | 20.9482 | 20.9323 | 20.7393 | 20.1730 | 19.4210 | 18.7876 (87) |
| Th 2                                                                        | 19.7749 | 19.7769 | 19.7789 | 19.7883 | 19.7900 | 19.7982 | 19.7982 | 19.7997 | 19.7950 | 19.7900 | 19.7865 | 19.7828 (88) |
| util rest of house                                                          | 0.9503  | 0.9221  | 0.8794  | 0.7949  | 0.6642  | 0.4865  | 0.3288  | 0.3661  | 0.5904  | 0.8184  | 0.9221  | 0.9563 (89)  |
| MIT 2                                                                       | 17.3243 | 17.7273 | 18.2599 | 18.9090 | 19.4050 | 19.6941 | 19.7759 | 19.7681 | 19.6011 | 18.9780 | 18.0578 | 17.2563 (90) |
| Living area fraction                                                        |         |         |         |         |         |         |         |         |         |         |         |              |
| MIT                                                                         | 17.7842 | 18.1628 | 18.6642 | 19.2783 | 19.7559 | 20.0421 | 20.1303 | 20.1201 | 19.9452 | 19.3393 | 18.4699 | 17.7192 (92) |
| Temperature adjustment                                                      |         |         |         |         |         |         |         |         |         |         |         | 0.0000       |
| adjusted MIT                                                                | 17.7842 | 18.1628 | 18.6642 | 19.2783 | 19.7559 | 20.0421 | 20.1303 | 20.1201 | 19.9452 | 19.3393 | 18.4699 | 17.7192 (93) |

## 8. Space heating requirement

|                                                                                | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov           | Dec       |       |
|--------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|-----------|-------|
| Utilisation                                                                    | 0.9320   | 0.9007   | 0.8572   | 0.7783   | 0.6624   | 0.5049   | 0.3602   | 0.3971   | 0.6014   | 0.8022   | 0.9017        | 0.9392    | (94)  |
| Useful gains                                                                   | 443.7829 | 503.0248 | 527.2977 | 523.8586 | 466.5919 | 348.5736 | 238.4643 | 248.3219 | 354.4176 | 423.4796 | 427.9382      | 425.7640  | (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                                                               | 963.6020 | 945.9780 | 866.0015 | 732.3741 | 567.5448 | 380.4414 | 246.7935 | 259.6849 | 409.8480 | 615.6929 | 803.7122      | 958.9833  | (97)  |
| Space heating kWh                                                              | 386.7454 | 297.6646 | 251.9956 | 150.1312 | 75.1090  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 143.0067 | 270.5573      | 396.7152  | (98a) |
| Space heating requirement - total per year (kWh/year)                          |          |          |          |          |          |          |          |          |          |          |               | 1971.9249 |       |
| 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                                                              | 386.7454 | 297.6646 | 251.9956 | 150.1312 | 75.1090  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 143.0067 | 270.5573      | 396.7152  | (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) |          |          |          |          |          |          |          |          |          |          |               | 1971.9249 |       |
| Space heating per m2                                                           |          |          |          |          |          |          |          |          |          |          | (98c) / (4) = | 38.2156   | (99)  |

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

|                                                                       |          |          |          |          |          |          |          |          |          |          |          |                |
|-----------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------|
| Fraction of space heat from secondary/supplementary system (Table 11) |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (201)   |
| Fraction of space heat from main system(s)                            |          |          |          |          |          |          |          |          |          |          |          | 1.0000 (202)   |
| Efficiency of main space heating system 1 (in %)                      |          |          |          |          |          |          |          |          |          |          |          | 92.4000 (206)  |
| Efficiency of main space heating system 2 (in %)                      |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (207)   |
| Efficiency of secondary/supplementary heating system, %               |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (208)   |
| Jan                                                                   | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec      |                |
| Space heating requirement                                             | 386.7454 | 297.6646 | 251.9956 | 150.1312 | 75.1090  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 143.0067 | 270.5573 | 396.7152 (98)  |
| Space heating efficiency (main heating system 1)                      | 92.4000  | 92.4000  | 92.4000  | 92.4000  | 92.4000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 92.4000  | 92.4000  | 92.4000 (210)  |
| Space heating fuel (main heating system)                              | 418.5556 | 322.1478 | 272.7225 | 162.4796 | 81.2868  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 154.7692 | 292.8109 | 429.3454 (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                                             | 198.9365 | 176.1276 | 187.7265 | 166.3484 | 160.5078 | 143.7966 | 141.9012 | 148.5503 | 151.1002 | 169.0284 | 177.9903 | 196.9873 (64)  |
| Efficiency of water heater                                            | 85.7795  | 85.4962  | 85.0130  | 84.1622  | 82.8551  | 80.3000  | 80.3000  | 80.3000  | 80.3000  | 84.0253  | 85.2759  | 80.3000 (216)  |
| Fuel for water heating, kWh/month                                     | 231.9161 | 206.0065 | 220.8210 | 197.6520 | 193.7211 | 179.0742 | 176.7139 | 184.9941 | 188.1697 | 201.1637 | 208.7228 | 229.4569 (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                                                              | 15.9130  | 12.7660  | 11.4943  | 8.4213   | 6.5048   | 5.3145   | 5.9339   | 7.7131   | 10.0186  | 13.1449  | 14.8472  | 16.3552 (232)  |
| Electricity generated by PVs (Appendix M) (negative quantity)         |          |          |          |          |          |          |          |          |          |          |          |                |
| (233a)m                                                               | -9.8504  | -14.9527 | -23.1257 | -28.0490 | -32.0951 | -30.6566 | -30.2971 | -27.6773 | -23.3969 | -17.9762 | -11.2048 | -8.3975 (233a) |

# Full SAP Calculation Printout



|                                                                                                      |         |         |          |          |          |          |          |          |          |         |         |           |        |
|------------------------------------------------------------------------------------------------------|---------|---------|----------|----------|----------|----------|----------|----------|----------|---------|---------|-----------|--------|
| Electricity generated by wind turbines (Appendix M) (negative quantity)                              |         |         |          |          |          |          |          |          |          |         |         |           |        |
| (234a)m                                                                                              | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000    | (234a) |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity)                  |         |         |          |          |          |          |          |          |          |         |         |           |        |
| (235a)m                                                                                              | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000    | (235a) |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) |         |         |          |          |          |          |          |          |          |         |         |           |        |
| (235c)m                                                                                              | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000    | (235c) |
| Electricity generated by PVs (Appendix M) (negative quantity)                                        |         |         |          |          |          |          |          |          |          |         |         |           |        |
| (233b)m                                                                                              | -2.7417 | -5.9543 | -12.1892 | -18.8385 | -25.4332 | -25.7364 | -25.4213 | -21.2720 | -15.2738 | -8.6724 | -3.7107 | -2.1536   | (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                                                                   |         |         |          |          |          |          |          |          |          |         |         | 2134.1178 | (211)  |
| Space heating fuel - main system 2                                                                   |         |         |          |          |          |          |          |          |          |         |         | 0.0000    | (213)  |
| Space heating fuel - secondary                                                                       |         |         |          |          |          |          |          |          |          |         |         | 0.0000    | (215)  |
| Efficiency of water heater                                                                           |         |         |          |          |          |          |          |          |          |         |         | 80.3000   |        |
| Water heating fuel used                                                                              |         |         |          |          |          |          |          |          |          |         |         | 2418.4121 | (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)                                                  |         |         |          |          |          |          |          |          |          |         |         | 128.4268  | (232)  |
| Energy saving/generation technologies (Appendices M ,N and Q)                                        |         |         |          |          |          |          |          |          |          |         |         |           |        |
| PV generation                                                                                        |         |         |          |          |          |          |          |          |          |         |         | -425.0765 | (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                                                                  |         |         |          |          |          |          |          |          |          |         |         | 4341.8802 | (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                 | 2134.1178          | 0.2100                        | 448.1647                 | (261) |
| Total CO2 associated with community systems   |                    |                               | 0.0000                   | (373) |
| Water heating (other fuel)                    | 2418.4121          | 0.2100                        | 507.8665                 | (264) |
| Space and water heating                       |                    |                               | 956.0313                 | (265) |
| Pumps, fans and electric keep-hot             | 86.0000            | 0.1387                        | 11.9293                  | (267) |
| Energy for lighting                           | 128.4268           | 0.1443                        | 18.5360                  | (268) |
| Energy saving/generation technologies         |                    |                               |                          |       |
| PV Unit electricity used in dwelling          | -257.6794          | 0.1331                        | -34.2854                 |       |
| PV Unit electricity exported                  | -167.3972          | 0.1251                        | -20.9384                 |       |
| Total                                         |                    |                               | -55.2237                 | (269) |
| Total CO2, kg/year                            |                    |                               | 931.2727                 | (272) |
| EPC Target Carbon Dioxide Emission Rate (TER) |                    |                               | 18.0500                  | (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               | 2134.1178          | 1.1300                              | 2411.5531                  | (275) |
| Total CO2 associated with community systems |                    |                                     | 0.0000                     | (473) |
| Water heating (other fuel)                  | 2418.4121          | 1.1300                              | 2732.8056                  | (278) |
| Space and water heating                     |                    |                                     | 5144.3588                  | (279) |
| Pumps, fans and electric keep-hot           | 86.0000            | 1.5128                              | 130.1008                   | (281) |
| Energy for lighting                         | 128.4268           | 1.5338                              | 196.9853                   | (282) |
| Energy saving/generation technologies       |                    |                                     |                            |       |
| PV Unit electricity used in dwelling        | -257.6794          | 1.4917                              | -384.3697                  |       |
| PV Unit electricity exported                | -167.3972          | 0.4591                              | -76.8518                   |       |
| Total                                       |                    |                                     | -461.2214                  | (283) |
| Total Primary energy kWh/year               |                    |                                     | 5010.2234                  | (286) |
| Target Primary Energy Rate (TPER)           |                    |                                     | 97.1000                    | (287) |