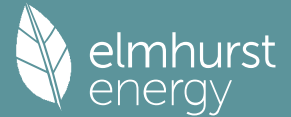


Full SAP Calculation Printout



| | | | | | |
|------------------------------------|---|---------------|----------------|-------------|-----------|
| Property Reference | Flat 4 | | Issued on Date | 26/07/2023 | |
| Assessment Reference | Flat 4 - Baseline | Prop Type Ref | | | |
| Property | Flat 4, Pier View Hotel, 34 Oldminster Road, Sharpness, Berkeley, G13 9NA | | | | |
| SAP Rating | 80 C | DER | 20.64 | TER | 9.91 |
| Environmental | 82 B | % DER < TER | | | -108.27 |
| CO ₂ Emissions (t/year) | 1.6 | DFEE | 62.69 | TFEE | 28.57 |
| Compliance Check | See BREL | | | | |
| % DPER < TPER | -120.08 | DPER | 114.07 | TPER | 51.83 |
| Assessor Details | | | | Assessor ID | AW87-0001 |
| 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

| | | | | |
|---|---------|------------------------|-------------------|---|
| Ground floor | | Area (m ²) | Storey height (m) | Volume (m ³) |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n) | 91.1100 | 91.1100 (1b) | x 2.8000 (2b) | = 255.1080 (1b) - (4) |
| Dwelling volume | | | | (3a)+(3b)+(3c)+(3d)+(3e)... (3n) = 255.1080 (5) |

2. Ventilation rate

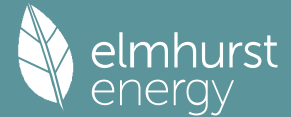
| | | |
|--|-----------------------------|--------------|
| Number of open chimneys | 0 * 80 = | 0.0000 (6a) |
| Number of open flues | 0 * 20 = | 0.0000 (6b) |
| Number of chimneys / flues attached to closed fire | 0 * 10 = | 0.0000 (6c) |
| Number of flues attached to solid fuel boiler | 0 * 20 = | 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) = | 0.0784 (8) |
| Pressure test | No | |
| Pressure Test Method | Blower Door | |
| Measured/design AP50 | 15.0000 | (17) |
| Infiltration rate | 0.8284 | (18) |
| Number of sides sheltered | 1 | (19) |
| Shelter factor | (20) = 1 - [0.075 x (19)] = | 0.9250 (20) |
| Infiltration rate adjusted to include shelter factor | (21) = (18) x (20) = | 0.7663 (21) |

| | | | | | | | | | | | | |
|-----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------|
| Wind speed | Jan 5.1000 | Feb 5.0000 | Mar 4.9000 | Apr 4.4000 | May 4.3000 | Jun 3.8000 | Jul 3.8000 | Aug 3.7000 | Sep 4.0000 | Oct 4.3000 | Nov 4.5000 | Dec 4.7000 (22) |
| Wind factor | 1.2750 | 1.2500 | 1.2250 | 1.1000 | 1.0750 | 0.9500 | 0.9500 | 0.9250 | 1.0000 | 1.0750 | 1.1250 | 1.1750 (22a) |
| Adj infilt rate | 0.9770 | 0.9578 | 0.9387 | 0.8429 | 0.8237 | 0.7280 | 0.7280 | 0.7088 | 0.7663 | 0.8237 | 0.8621 | 0.9004 (22b) |
| Effective ac | 0.9773 | 0.9587 | 0.9406 | 0.8552 | 0.8393 | 0.7650 | 0.7650 | 0.7512 | 0.7936 | 0.8393 | 0.8716 | 0.9053 (25) |

3. Heat losses and heat loss parameter

| | | | | | | | |
|--|----------------------|-------------------------|------------------------|----------------------------|-----------|-----------------------------|-----------------|
| Element | Gross m ² | Openings m ² | NetArea m ² | U-value W/m ² K | A x U W/K | K-value kJ/m ² K | A x K kJ/K |
| Door | | | 1.7200 | 1.4000 | 2.4080 | | (26) |
| New Windows (U _w = 1.40) | | | 12.1600 | 1.3258 | 16.1212 | | (27) |
| External Wall | 82.8500 | 12.1600 | 70.6900 | 0.3000 | 21.2070 | 110.0000 | 7775.9000 (29a) |
| Corridor Wall | 17.2800 | 1.7200 | 15.5600 | 0.3000 | 4.6680 | 9.0000 | 140.0400 (29a) |
| Total net area of external elements A _{um} (A, m ²) | | | 100.1300 | | | | (31) |
| Fabric heat loss, W/K = Sum (A x U) | | | | (26)... (30) + (32) = | 44.4042 | | (33) |
| Party Wall | | | 29.1200 | 0.0000 | 0.0000 | 180.0000 | 5241.6000 (32) |
| Party Floor | | | 91.1100 | | | 40.0000 | 3644.4000 (32d) |

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| | | | |
|---------------------------|---------|---------|-----------------|
| Party Ceiling | 91.1100 | 30.0000 | 2733.3000 (32b) |
| Internal Wall Lower Floor | 43.2700 | 9.0000 | 389.4300 (32c) |
| Internal Wall Upper Floor | 56.8400 | 9.0000 | 511.5600 (32c) |

| | | |
|--|--------------------------------------|-----------------|
| Heat capacity Cm = Sum(A x k) | (28)...(30) + (32) + (32a)...(32e) = | 20436.2300 (34) |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K | | 224.3028 (35) |
| Thermal bridges (Default value 0.200 * total exposed area) | | 20.0260 (36) |
| Point Thermal bridges | (36a) = | 0.0000 |
| Total fabric heat loss | (33) + (36) + (36a) = | 64.4302 (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 | 82.2710 | 80.7108 | 79.1815 | 71.9986 | 70.6547 | 64.3986 | 64.3986 | 63.2400 | 66.8083 | 70.6547 | 73.3734 | 76.2157 (38) |
| Average = Sum(39)m / 12 = | 146.7012 | 145.1410 | 143.6118 | 136.4288 | 135.0849 | 128.8288 | 128.8288 | 127.6702 | 131.2386 | 135.0849 | 137.8036 | 140.6459 (39) |

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------------|
| HLP | 1.6102 | 1.5930 | 1.5762 | 1.4974 | 1.4827 | 1.4140 | 1.4140 | 1.4013 | 1.4404 | 1.4827 | 1.5125 | 1.5437 (40) |
| HLP (average) | | | | | | | | | | | | 1.4973 |
| Days in mont | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 |

4. Water heating energy requirements (kWh/year)

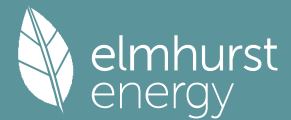
| | | | | | | | | | | | | | |
|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------|----------------|
| Assumed occupancy | | | | | | | | | | | | | 2.6406 (42) |
| Hot water usage for mixer showers | 120.9883 | 119.1701 | 116.5206 | 111.4513 | 107.7102 | 103.5382 | 101.1669 | 103.7963 | 106.6787 | 111.1581 | 116.3364 | 120.5248 (42a) | |
| Hot water usage for baths | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (42b) | |
| Hot water usage for other uses | 41.6725 | 40.1571 | 38.6418 | 37.1264 | 35.6110 | 34.0957 | 34.0957 | 35.6110 | 37.1264 | 38.6418 | 40.1571 | 41.6725 (42c) | |
| Average daily hot water use (litres/day) | | | | | | | | | | | | | 149.4313 (43) |
| Daily hot water use | 162.6608 | 159.3272 | 155.1624 | 148.5777 | 143.3213 | 137.6339 | 135.2626 | 139.4074 | 143.8051 | 149.7999 | 156.4935 | 162.1973 (44) | |
| Energy content (annual) | 257.6150 | 226.8799 | 238.4788 | 203.3954 | 192.9380 | 169.2370 | 163.5883 | 172.6154 | 177.3261 | 203.2771 | 222.9537 | 253.9617 (45) | |
| Distribution loss (46)m = 0.15 x (45)m | 38.6422 | 34.0320 | 35.7718 | 30.5093 | 28.9407 | 25.3855 | 24.5383 | 25.8923 | 26.5989 | 30.4916 | 33.4431 | 38.0943 (46) | |
| Water storage 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 | | | | | | | | | | | | | |
| 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 (57) | |
| Combi loss | 0.5802 | 0.5564 | 0.6444 | 0.6300 | 0.6584 | 0.6353 | 0.6374 | 0.6296 | 0.6000 | 0.6147 | 0.5847 | 0.5791 (61) | |
| Total heat required for water heating calculated for each month | 258.1952 | 227.4363 | 239.1232 | 204.0254 | 193.5964 | 169.8723 | 164.2257 | 173.2451 | 177.9261 | 203.8918 | 223.5383 | 254.5408 (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 | 258.1952 | 227.4363 | 239.1232 | 204.0254 | 193.5964 | 169.8723 | 164.2257 | 173.2451 | 177.9261 | 203.8918 | 223.5383 | 254.5408 (64) | |
| Total per year (kWh/year) | | | | | | | | | | | | | 2489.6165 (64) |
| Electric shower(s) | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (64a) | |
| Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = | | | | | | | | | | | | | 0.0000 (64a) |
| Heat gains from water heating, kWh/month | 85.8020 | 75.5767 | 79.4553 | 67.7865 | 64.3165 | 56.4301 | 54.5525 | 57.5520 | 59.1109 | 67.7433 | 74.2783 | 84.5870 (65) | |

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

| | | | | | | | | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------------|--|
| Metabolic gains (Table 5), Watts | | | | | | | | | | | | | |
| (66)m | 132.0305 | 132.0305 | 132.0305 | 132.0305 | 132.0305 | 132.0305 | 132.0305 | 132.0305 | 132.0305 | 132.0305 | 132.0305 | 132.0305 (66) | |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 | 131.8393 | 145.9649 | 131.8393 | 136.2339 | 131.8393 | 136.2339 | 131.8393 | 131.8393 | 136.2339 | 131.8393 | 136.2339 | 131.8393 (67) | |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 241.1051 | 243.6070 | 237.3022 | 223.8802 | 206.9372 | 191.0133 | 180.3751 | 177.8732 | 184.1779 | 197.6000 | 214.5429 | 230.4669 (68) | |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 | 36.2031 | 36.2031 | 36.2031 | 36.2031 | 36.2031 | 36.2031 | 36.2031 | 36.2031 | 36.2031 | 36.2031 | 36.2031 | 36.2031 (69) | |
| Pumps, fans | 3.0000 | 3.0000 | 3.0000 | 3.0000 | 3.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 3.0000 | 3.0000 | 3.0000 (70) | |
| Losses e.g. evaporation (negative values) (Table 5) | -105.6244 | -105.6244 | -105.6244 | -105.6244 | -105.6244 | -105.6244 | -105.6244 | -105.6244 | -105.6244 | -105.6244 | -105.6244 | -105.6244 (71) | |
| Water heating gains (Table 5) | 115.3253 | 112.4653 | 106.7948 | 94.1479 | 86.4469 | 78.3752 | 73.3232 | 77.3549 | 82.0985 | 91.0528 | 103.1643 | 113.6923 (72) | |
| Total internal gains | 553.8788 | 567.6463 | 541.5454 | 519.8711 | 490.8325 | 468.2315 | 448.1467 | 449.6765 | 465.1195 | 486.1012 | 519.5502 | 541.6076 (73) | |

6. Solar gains

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| [Jan] | | Area m ² | Solar flux Table 6a W/m ² | Specific data or Table 6b | Specific data or Table 6c | Access factor Table 6d | Gains W |
|-------|--|------------------------|--|------------------------------|------------------------------|------------------------------|--------------|
| North | | 4.0500 | 10.6334 | 0.6300 | 0.7000 | 0.7700 | 13.1613 (74) |
| South | | 3.8900 | 46.7521 | 0.6300 | 0.7000 | 0.7700 | 55.5805 (78) |
| West | | 4.2200 | 19.6403 | 0.6300 | 0.7000 | 0.7700 | 25.3298 (80) |

| | | | | | | | | | | | | |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| Solar gains | 94.0716 | 165.7288 | 240.2934 | 318.7131 | 374.8950 | 379.7313 | 362.9850 | 320.1356 | 267.4187 | 186.9165 | 113.7012 | 79.8285 (83) |
| Total gains | 647.9504 | 733.3751 | 781.8388 | 838.5842 | 865.7275 | 847.9627 | 811.1317 | 769.8120 | 732.5381 | 673.0176 | 633.2515 | 621.4361 (84) |

7. Mean internal temperature (heating season)

| Temperature during heating periods in the living area from Table 9, Th1 (C) | | | | | | | | | | | | 21.0000 (85) |
|---|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| Utilisation Factor for gains for living area, n _{l,m} (see Table 9a) | | | | | | | | | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| tau | 38.6959 | 39.1118 | 39.5283 | 41.6095 | 42.0234 | 44.0641 | 44.0641 | 44.4640 | 43.2551 | 42.0234 | 41.1944 | 40.3619 |
| alpha | 3.5797 | 3.6075 | 3.6352 | 3.7740 | 3.8016 | 3.9376 | 3.9376 | 3.9643 | 3.8837 | 3.8016 | 3.7463 | 3.6908 |
| util living area | 0.9937 | 0.9895 | 0.9821 | 0.9602 | 0.9093 | 0.7861 | 0.6370 | 0.6792 | 0.8700 | 0.9673 | 0.9894 | 0.9947 (86) |
| MIT | 18.8805 | 19.1033 | 19.4477 | 19.9869 | 20.4365 | 20.8079 | 20.9389 | 20.9214 | 20.6752 | 20.0943 | 19.4600 | 18.9274 (87) |
| Th 2 | 19.6059 | 19.6184 | 19.6308 | 19.6894 | 19.7005 | 19.7526 | 19.7526 | 19.7624 | 19.7325 | 19.7005 | 19.6781 | 19.6549 (88) |
| util rest of house | 0.9917 | 0.9860 | 0.9757 | 0.9448 | 0.8694 | 0.6904 | 0.4838 | 0.5319 | 0.7988 | 0.9515 | 0.9853 | 0.9930 (89) |
| MIT 2 | 17.7248 | 17.9549 | 18.3049 | 18.8751 | 19.3063 | 19.6573 | 19.7359 | 19.7382 | 19.5459 | 18.9929 | 18.3527 | 17.8058 (90) |
| Living area fraction | FLA = Living area / (4) = | | | | | | | | | | | 0.1123 (91) |
| MIT | 17.8546 | 18.0838 | 18.4332 | 18.9999 | 19.4332 | 19.7864 | 19.8710 | 19.8710 | 19.6727 | 19.1166 | 18.4770 | 17.9317 (92) |
| Temperature adjustment | | | | | | | | | | | | 0.0000 |
| adjusted MIT | 17.8546 | 18.0838 | 18.4332 | 18.9999 | 19.4332 | 19.7864 | 19.8710 | 19.8710 | 19.6727 | 19.1166 | 18.4770 | 17.9317 (93) |

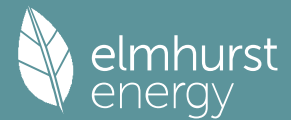
8. Space heating requirement

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|-----------|----------------------------|
| Utilisation | 0.9878 | 0.9804 | 0.9678 | 0.9337 | 0.8589 | 0.6935 | 0.4998 | 0.5464 | 0.7946 | 0.9415 | 0.9798 | 0.9896 (94) |
| Useful gains | 640.0142 | 718.9816 | 756.6542 | 783.0179 | 743.5662 | 588.0212 | 405.3990 | 420.6320 | 582.0707 | 633.6337 | 620.4329 | 614.9891 (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 | 1988.4754 | 1913.5132 | 1713.7467 | 1377.9175 | 1044.6433 | 668.1639 | 421.3933 | 443.1445 | 731.3580 | 1150.4651 | 1567.7937 | 1931.3089 (97) |
| Space heating kWh | 1003.2552 | 802.7252 | 712.0768 | 428.3277 | 224.0013 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 384.5226 | 682.0998 | 979.3419 (98a) |
| Space heating requirement - total per year (kWh/year) | | | | | | | | | | | | 5216.3505 |
| 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 | 1003.2552 | 802.7252 | 712.0768 | 428.3277 | 224.0013 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 384.5226 | 682.0998 | 979.3419 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) | | | | | | | | | | | | 5216.3505 |
| Space heating per m ² | | | | | | | | | | | | (98c) / (4) = 57.2533 (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 %) | | | | | | | | | | | | 89.1000 (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 | 1003.2552 | 802.7252 | 712.0768 | 428.3277 | 224.0013 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 384.5226 | 682.0998 | 979.3419 (98) |
| Space heating efficiency (main heating system 1) | 89.1000 | 89.1000 | 89.1000 | 89.1000 | 89.1000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 89.1000 | 89.1000 | 89.1000 (210) |
| Space heating fuel (main heating system) | 1125.9878 | 900.9262 | 799.1883 | 480.7269 | 251.4044 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 431.5629 | 765.5441 | 1099.1492 (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 | 258.1952 | 227.4363 | 239.1232 | 204.0254 | 193.5964 | 169.8723 | 164.2257 | 173.2451 | 177.9261 | 203.8918 | 223.5383 | 254.5408 (64) |
| Efficiency of water heater (217)m | 88.2289 | 88.1611 | 88.0325 | 87.7346 | 87.1512 | 85.0000 | 85.0000 | 85.0000 | 85.0000 | 87.6353 | 88.0517 | 85.0000 (216) |
| Fuel for water heating, kWh/month | 292.6424 | 257.9779 | 271.6305 | 232.5484 | 222.1387 | 199.8497 | 193.2067 | 203.8177 | 209.3248 | 232.6595 | 253.8718 | 288.5226 (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 | 33.6970 | 27.0330 | 24.3402 | 17.8327 | 13.7745 | 11.2539 | 12.5655 | 16.3331 | 21.2151 | 27.8354 | 31.4400 | 34.6335 (232) |
| Electricity generated by PVs (Appendix M) (negative quantity) | | | | | | | | | | | | |

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| | | | | | | | | | | | | | |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------------|
| (233a)m | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | (233a) |
| Electricity generated by wind turbines (Appendix M) (negative quantity) | | | | | | | | | | | | | (234a) |
| (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) |
| (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) |
| (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) |
| (233b)m | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | (233b) |
| Electricity generated by wind turbines (Appendix M) (negative quantity) | | | | | | | | | | | | | (234b) |
| (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) |
| (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) |
| (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 | | | | | | | | | | | | | 5854.4899 (211) |
| Space heating fuel - main system 2 | | | | | | | | | | | | | 0.0000 (213) |
| Space heating fuel - secondary | | | | | | | | | | | | | 0.0000 (215) |
| Efficiency of water heater | | | | | | | | | | | | | 85.0000 |
| Water heating fuel used | | | | | | | | | | | | | 2858.1907 (219) |
| Space cooling fuel | | | | | | | | | | | | | 0.0000 (221) |
| Electricity for pumps and fans: | | | | | | | | | | | | | |
| central heating pump | | | | | | | | | | | | | 41.0000 (230c) |
| main heating flue fan | | | | | | | | | | | | | 45.0000 (230e) |
| Total electricity for the above, kWh/year | | | | | | | | | | | | | 86.0000 (231) |
| Electricity for lighting (calculated in Appendix L) | | | | | | | | | | | | | 271.9539 (232) |
| Energy saving/generation technologies (Appendices M, N and O) | | | | | | | | | | | | | |
| PV generation | | | | | | | | | | | | | 0.0000 (233) |
| Wind generation | | | | | | | | | | | | | 0.0000 (234) |
| Hydro-electric generation (Appendix N) | | | | | | | | | | | | | 0.0000 (235a) |
| Electricity generated - Micro CHP (Appendix N) | | | | | | | | | | | | | 0.0000 (235) |
| Appendix Q - special features | | | | | | | | | | | | | |
| Energy saved or generated | | | | | | | | | | | | | -0.0000 (236) |
| Energy used | | | | | | | | | | | | | 0.0000 (237) |
| Total delivered energy for all uses | | | | | | | | | | | | | 9070.6344 (238) |

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
|---|--------------------|-------------------------------|--------------------------|
| Space heating - main system 1 | 5854.4899 | 0.2100 | 1229.4429 (261) |
| Total CO2 associated with community systems | | | 0.0000 (373) |
| Water heating (other fuel) | 2858.1907 | 0.2100 | 600.2200 (264) |
| Space and water heating | | | 1829.6629 (265) |
| Pumps, fans and electric keep-hot | 86.0000 | 0.1387 | 11.9293 (267) |
| Energy for lighting | 271.9539 | 0.1443 | 39.2513 (268) |
| Total CO2, kg/year | | | 1880.8435 (272) |
| EPC Dwelling Carbon Dioxide Emission Rate (DER) | | | 20.6400 (273) |

13a. Primary energy - Individual heating systems including micro-CHP

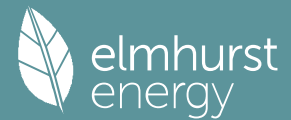
| | Energy kWh/year | Primary energy factor kg CO2/kWh | Primary energy kWh/year |
|---|--------------------|-------------------------------------|----------------------------|
| Space heating - main system 1 | 5854.4899 | 1.1300 | 6615.5736 (275) |
| Total CO2 associated with community systems | | | 0.0000 (473) |
| Water heating (other fuel) | 2858.1907 | 1.1300 | 3229.7555 (278) |
| Space and water heating | | | 9845.3291 (279) |
| Pumps, fans and electric keep-hot | 86.0000 | 1.5128 | 130.1008 (281) |
| Energy for lighting | 271.9539 | 1.5338 | 417.1319 (282) |
| Total Primary energy kWh/year | | | 10392.5618 (286) |
| Dwelling Primary energy Rate (DPER) | | | 114.0700 (287) |

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

1. Overall dwelling characteristics

| | Area (m ²) | Storey height (m) | Volume (m ³) |
|---|---------------------------|----------------------------------|-----------------------------|
| Ground floor | 91.1100 (1b) | x 2.8000 (2b) | = 255.1080 (1b) - |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n) | 91.1100 | | (4) |
| Dwelling volume | | (3a)+(3b)+(3c)+(3d)+(3e)... (3n) | = 255.1080 (5) |

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| | | | | | | | | | | | | |
|--|----------|----------|----------|----------|---------|--------|--------|--------|--------|----------|----------|----------------------------|
| Space heating requirement - total per year (kWh/year) | 473.2175 | 350.7057 | 277.7888 | 131.2289 | 41.4539 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 128.9663 | 308.0880 | 483.6392 (98a) |
| Solar heating kWh | | | | | | | | | | | | 2195.0883 |
| Solar heating contribution - total per year (kWh/year) | 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) |
| Space heating kWh | 473.2175 | 350.7057 | 277.7888 | 131.2289 | 41.4539 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 128.9663 | 308.0880 | 483.6392 (98c) |
| Space heating requirement after solar contribution - total per year (kWh/year) | | | | | | | | | | | | 2195.0883 |
| Space heating per m2 | | | | | | | | | | | | (98c) / (4) = 24.0927 (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 | 473.2175 | 350.7057 | 277.7888 | 131.2289 | 41.4539 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 128.9663 | 308.0880 | 483.6392 (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) | 512.1401 | 379.5517 | 300.6372 | 142.0226 | 44.8635 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 139.5739 | 333.4285 | 523.4191 (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 requirement | 216.0890 | 191.0501 | 203.3422 | 180.2529 | 175.6032 | 159.2301 | 158.1195 | 164.0022 | 165.3126 | 183.0920 | 193.0735 | 213.9724 (64) |
| Efficiency of water heater (217)m | 86.0122 | 85.6646 | 85.0503 | 83.7118 | 81.8115 | 80.3000 | 80.3000 | 80.3000 | 80.3000 | 83.6440 | 85.3773 | 80.3000 (216) |
| Fuel for water heating, kWh/month | 251.2305 | 223.0211 | 239.0845 | 215.3256 | 214.6437 | 198.2941 | 196.9109 | 204.2368 | 205.8688 | 218.8942 | 226.1414 | 248.5954 (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 | 27.3936 | 21.9762 | 19.7871 | 14.4969 | 11.1978 | 9.1487 | 10.2150 | 13.2779 | 17.2466 | 22.6285 | 25.5588 | 28.1549 (232) |
| Electricity generated by PVs (Appendix M) (negative quantity) (233a)m | -30.5796 | -44.2777 | -65.3328 | -75.4510 | -83.0510 | -78.1078 | -77.1373 | -71.9934 | -63.1916 | -51.5203 | -34.0275 | -26.3024 (233a) |
| Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (234a) |
| Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (235a) |
| Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (235c) |
| Electricity generated by PVs (Appendix M) (negative quantity) (233b)m | -13.8880 | -29.5531 | -59.3783 | -90.1271 | -120.1044 | -121.0384 | -119.6265 | -100.8660 | -73.3697 | -42.5865 | -18.6449 | -10.9579 (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 | | | | | | | | | | | | 2375.6367 (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 | | | | | | | | | | | | 2642.2469 (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) | 221.0820 (232) |

| | |
|---|------------------|
| Energy saving/generation technologies (Appendices M, N and O) | |
| PV generation | -1501.1133 (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 | 3823.8523 (238) |

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
|---|-----------------|----------------------------|-----------------------|
| Space heating - main system 1 | 2375.6367 | 0.2100 | 498.8837 (261) |
| Total CO2 associated with community systems | | | 0.0000 (373) |
| Water heating (other fuel) | 2642.2469 | 0.2100 | 554.8719 (264) |
| Space and water heating | | | 1053.7556 (265) |

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| | | | |
|---|-----------|--------|-----------------|
| Pumps, fans and electric keep-hot | 86.0000 | 0.1387 | 11.9293 (267) |
| Energy for lighting | 221.0820 | 0.1443 | 31.9090 (268) |
| Energy saving/generation technologies | | | |
| PV Unit electricity used in dwelling | -700.9724 | 0.1340 | -93.9571 |
| PV Unit electricity exported | -800.1409 | 0.1256 | -100.4848 |
| Total | | | -194.4419 (269) |
| Total CO2, kg/year | | | 903.1519 (272) |
| EPC Target Carbon Dioxide Emission Rate (TER) | | | 9.9100 (273) |

 13a. Primary energy - Individual heating systems including micro-CHP

| | Energy kWh/year | Primary energy factor kg CO2/kWh | Primary energy kWh/year |
|---|-----------------|----------------------------------|-------------------------|
| Space heating - main system 1 | 2375.6367 | 1.1300 | 2684.4695 (275) |
| Total CO2 associated with community systems | | | 0.0000 (473) |
| Water heating (other fuel) | 2642.2469 | 1.1300 | 2985.7390 (278) |
| Space and water heating | | | 5670.2085 (279) |
| Pumps, fans and electric keep-hot | 86.0000 | 1.5128 | 130.1008 (281) |
| Energy for lighting | 221.0820 | 1.5338 | 339.1029 (282) |
| Energy saving/generation technologies | | | |
| PV Unit electricity used in dwelling | -700.9724 | 1.4954 | -1048.2003 |
| PV Unit electricity exported | -800.1409 | 0.4610 | -368.8363 |
| Total | | | -1417.0366 (283) |
| Total Primary energy kWh/year | | | 4722.3757 (286) |
| Target Primary Energy Rate (TPER) | | | 51.8300 (287) |