

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

| | | | |
|---------------|--|-----------------|------------|
| Assessor name | Mr Adrian Fell | Assessor number | 3536 |
| Client | | Last modified | 23/05/2019 |
| Address | B2-A-04-04 West Cromwell Road, Kensington, London, W14 8 | | |

1. Overall dwelling dimensions

| | Area (m ²) | | Average storey height (m) | | Volume (m ³) |
|------------------|--|---|--|---|--|
| Lowest occupied | <input type="text" value="77.00"/> (1a) | x | <input type="text" value="2.55"/> (2a) | = | <input type="text" value="196.35"/> (3a) |
| Total floor area | (1a) + (1b) + (1c) + (1d)...(1n) = <input type="text" value="77.00"/> (4) | | | | |
| Dwelling volume | (3a) + (3b) + (3c) + (3d)...(3n) = <input type="text" value="196.35"/> (5) | | | | |

2. Ventilation rate

| | | | m ³ per hour |
|------------------------------|--------------------------------|--------|-------------------------------------|
| Number of chimneys | <input type="text" value="0"/> | x 40 = | <input type="text" value="0"/> (6a) |
| Number of open flues | <input type="text" value="0"/> | x 20 = | <input type="text" value="0"/> (6b) |
| Number of intermittent fans | <input type="text" value="0"/> | x 10 = | <input type="text" value="0"/> (7a) |
| Number of passive vents | <input type="text" value="0"/> | x 10 = | <input type="text" value="0"/> (7b) |
| Number of flueless gas fires | <input type="text" value="0"/> | x 40 = | <input type="text" value="0"/> (7c) |

| | | | Air changes per hour |
|---|---|---------|---------------------------------------|
| Infiltration due to chimneys, flues, fans, PSVs | (6a) + (6b) + (7a) + (7b) + (7c) = <input type="text" value="0"/> | ÷ (5) = | <input type="text" value="0.00"/> (8) |

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

| | |
|--|--|
| Air permeability value, q ₅₀ , expressed in cubic metres per hour per square metre of envelope area | <input type="text" value="3.00"/> (17) |
|--|--|

| | |
|--|--|
| If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16) | <input type="text" value="0.15"/> (18) |
|--|--|

| | |
|--|-------------------------------------|
| Number of sides on which the dwelling is sheltered | <input type="text" value="2"/> (19) |
|--|-------------------------------------|

| | |
|----------------|---|
| Shelter factor | 1 - [0.075 x (19)] = <input type="text" value="0.85"/> (20) |
|----------------|---|

| | |
|--|--|
| Infiltration rate incorporating shelter factor | (18) x (20) = <input type="text" value="0.13"/> (21) |
|--|--|

Infiltration rate modified for monthly wind speed:

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--|
| Monthly average wind speed from Table U2 | <input type="text" value="5.10"/> | <input type="text" value="5.00"/> | <input type="text" value="4.90"/> | <input type="text" value="4.40"/> | <input type="text" value="4.30"/> | <input type="text" value="3.80"/> | <input type="text" value="3.80"/> | <input type="text" value="3.70"/> | <input type="text" value="4.00"/> | <input type="text" value="4.30"/> | <input type="text" value="4.50"/> | <input type="text" value="4.70"/> (22) |

| | | | | | | | | | | | | |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---|
| Wind factor (22)m ÷ 4 | <input type="text" value="1.28"/> | <input type="text" value="1.25"/> | <input type="text" value="1.23"/> | <input type="text" value="1.10"/> | <input type="text" value="1.08"/> | <input type="text" value="0.95"/> | <input type="text" value="0.95"/> | <input type="text" value="0.93"/> | <input type="text" value="1.00"/> | <input type="text" value="1.08"/> | <input type="text" value="1.13"/> | <input type="text" value="1.18"/> (22a) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---|

| | | | | | | | | | | | | |
|---|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---|
| Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m | <input type="text" value="0.16"/> | <input type="text" value="0.16"/> | <input type="text" value="0.16"/> | <input type="text" value="0.14"/> | <input type="text" value="0.14"/> | <input type="text" value="0.12"/> | <input type="text" value="0.12"/> | <input type="text" value="0.12"/> | <input type="text" value="0.13"/> | <input type="text" value="0.14"/> | <input type="text" value="0.14"/> | <input type="text" value="0.15"/> (22b) |
|---|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---|

Calculate effective air change rate for the applicable case:

| | |
|---|---|
| If mechanical ventilation: air change rate through system | <input type="text" value="0.50"/> (23a) |
|---|---|

| | |
|--|--|
| If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h | <input type="text" value="79.05"/> (23c) |
|--|--|

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]

| | | | | | | | | | | | |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---|
| <input type="text" value="0.27"/> | <input type="text" value="0.26"/> | <input type="text" value="0.26"/> | <input type="text" value="0.25"/> | <input type="text" value="0.24"/> | <input type="text" value="0.23"/> | <input type="text" value="0.23"/> | <input type="text" value="0.22"/> | <input type="text" value="0.23"/> | <input type="text" value="0.24"/> | <input type="text" value="0.25"/> | <input type="text" value="0.25"/> (24a) |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---|

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)

| | | | | | | | | | | | |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--|
| <input type="text" value="0.27"/> | <input type="text" value="0.26"/> | <input type="text" value="0.26"/> | <input type="text" value="0.25"/> | <input type="text" value="0.24"/> | <input type="text" value="0.23"/> | <input type="text" value="0.23"/> | <input type="text" value="0.22"/> | <input type="text" value="0.23"/> | <input type="text" value="0.24"/> | <input type="text" value="0.25"/> | <input type="text" value="0.25"/> (25) |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|--|

3. Heat losses and heat loss parameter

| Element | Gross area, m ² | Openings m ² | Net area A, m ² | U-value W/m ² K | A x U W/K | κ-value, kJ/m ² .K | A x κ, kJ/K | | | | | | |
|---|-------------------------------|----------------------------|-------------------------------|-------------------------------|--------------------------------------|----------------------------------|----------------|-------|-------|-------|-------|-------|------|
| Window | | | 26.04 | 1.15 | 29.82 | | (27) | | | | | | |
| External wall | | | 31.56 | 0.15 | 4.73 | | (29a) | | | | | | |
| Party wall | | | 44.47 | 0.00 | 0.00 | | (32) | | | | | | |
| Total area of external elements ΣA, m ² | | | 57.60 | | | | (31) | | | | | | |
| Fabric heat loss, W/K = Σ(A × U) | | | | | (26)...(30) + (32) = | 34.55 | (33) | | | | | | |
| Heat capacity Cm = Σ(A × κ) | | | | | (28)...(30) + (32) + (32a)...(32e) = | N/A | (34) | | | | | | |
| Thermal mass parameter (TMP) in kJ/m ² K | | | | | | 250.00 | (35) | | | | | | |
| Thermal bridges: Σ(L × Ψ) calculated using Appendix K | | | | | | 8.64 | (36) | | | | | | |
| Total fabric heat loss | | | | | (33) + (36) = | 43.19 | (37) | | | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
| Ventilation heat loss calculated monthly 0.33 x (25)m x (5) | 17.32 | 17.11 | 16.91 | 15.87 | 15.67 | 14.64 | 14.64 | 14.43 | 15.05 | 15.67 | 16.08 | 16.49 | (38) |
| Heat transfer coefficient, W/K (37)m + (38)m | 60.51 | 60.30 | 60.10 | 59.07 | 58.86 | 57.83 | 57.83 | 57.62 | 58.24 | 58.86 | 59.27 | 59.69 | |
| | Average = Σ(39)1...12/12 = | | | | | | | | | | 59.01 | (39) | |
| Heat loss parameter (HLP), W/m ² K (39)m ÷ (4) | 0.79 | 0.78 | 0.78 | 0.77 | 0.76 | 0.75 | 0.75 | 0.75 | 0.76 | 0.76 | 0.77 | 0.78 | |
| | Average = Σ(40)1...12/12 = | | | | | | | | | | 0.77 | (40) | |
| Number of days in month (Table 1a) | 31.00 | 28.00 | 31.00 | 30.00 | 31.00 | 30.00 | 31.00 | 31.00 | 30.00 | 31.00 | 30.00 | 31.00 | (40) |

4. Water heating energy requirement

| | | | | | | | | | | | | | |
|--|--------|--------|--------|--------|--------|-------|-------|--------|--------|--------|-----------------------|---------|------|
| Assumed occupancy, N | | | | | | | | | | | 2.40 | (42) | |
| Annual average hot water usage in litres per day $V_{d,average} = (25 \times N) + 36$ | | | | | | | | | | | 91.28 | (43) | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
| Hot water usage in litres per day for each month $V_{d,m} = \text{factor from Table 1c} \times (43)$ | | | | | | | | | | | | | |
| | 100.41 | 96.76 | 93.11 | 89.46 | 85.81 | 82.15 | 82.15 | 85.81 | 89.46 | 93.11 | 96.76 | 100.41 | |
| | | | | | | | | | | | $\sum(44)_{1...12} =$ | 1095.39 | (44) |
| Energy content of hot water used = $4.18 \times V_{d,m} \times n_m \times T_m / 3600$ kWh/month (see Tables 1b, 1c 1d) | | | | | | | | | | | | | |
| | 148.91 | 130.23 | 134.39 | 117.16 | 112.42 | 97.01 | 89.90 | 103.16 | 104.39 | 121.65 | 132.80 | 144.21 | |
| | | | | | | | | | | | $\sum(45)_{1...12} =$ | 1436.23 | (45) |
| Distribution loss $0.15 \times (45)_m$ | | | | | | | | | | | | | |
| | 22.34 | 19.54 | 20.16 | 17.57 | 16.86 | 14.55 | 13.48 | 15.47 | 15.66 | 18.25 | 19.92 | 21.63 | (46) |
| Storage volume (litres) including any solar or WWHRS storage within same vessel | | | | | | | | | | | 4.00 | (47) | |
| Water storage loss: | | | | | | | | | | | | | |
| b) Manufacturer's declared loss factor is not known | | | | | | | | | | | | | |
| Hot water storage loss factor from Table 2 (kWh/litre/day) | | | | | | | | | | | 0.02 | (51) | |
| Volume factor from Table 2a | | | | | | | | | | | 3.11 | (52) | |
| Temperature factor from Table 2b | | | | | | | | | | | 1.00 | (53) | |
| Energy lost from water storage (kWh/day) $(47) \times (51) \times (52) \times (53)$ | | | | | | | | | | | 0.30 | (54) | |
| Enter (50) or (54) in (55) | | | | | | | | | | | 0.30 | (55) | |
| Water storage loss calculated for each month $(55) \times (41)_m$ | | | | | | | | | | | | | |
| | 9.23 | 8.34 | 9.23 | 8.94 | 9.23 | 8.94 | 9.23 | 9.23 | 8.94 | 9.23 | 8.94 | 9.23 | (56) |
| If the vessel contains dedicated solar storage or dedicated WWHRS $(56)_m \times [(47) - V_s] \div (47)$, else (56) | | | | | | | | | | | | | |
| | 9.23 | 8.34 | 9.23 | 8.94 | 9.23 | 8.94 | 9.23 | 9.23 | 8.94 | 9.23 | 8.94 | 9.23 | (57) |

Primary circuit loss for each month from Table 3

| | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 23.26 | 21.01 | 23.26 | 22.51 | 23.26 | 22.51 | 23.26 | 23.26 | 22.51 | 23.26 | 22.51 | 23.26 | (59) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

Combi loss for each month from Table 3a, 3b or 3c

| | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | (61) |
|------|------|------|------|------|------|------|------|------|------|------|------|------|

Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m

| | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| 181.40 | 159.59 | 166.89 | 148.61 | 144.92 | 128.46 | 122.39 | 135.65 | 135.84 | 154.15 | 164.24 | 176.70 | (62) |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

Solar DHW input calculated using Appendix G or Appendix H

| | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | (63) |
|------|------|------|------|------|------|------|------|------|------|------|------|------|

Output from water heater for each month (kWh/month) (62)m + (63)m

| | | | | | | | | | | | | |
|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|------|
| 181.40 | 159.59 | 166.89 | 148.61 | 144.92 | 128.46 | 122.39 | 135.65 | 135.84 | 154.15 | 164.24 | 176.70 | |
| $\Sigma(64)1...12 =$ | | | | | | | | | | | 1818.85 | (64) |

Heat gains from water heating (kWh/month) 0.25 x [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

| | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 75.51 | 66.78 | 70.68 | 64.12 | 63.38 | 57.41 | 55.89 | 60.30 | 59.87 | 66.45 | 69.31 | 73.95 | (65) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

5. Internal gains

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

Metabolic gains (Table 5)

| | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| 120.17 | 120.17 | 120.17 | 120.17 | 120.17 | 120.17 | 120.17 | 120.17 | 120.17 | 120.17 | 120.17 | 120.17 | (66) |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

| | | | | | | | | | | | | |
|-------|-------|-------|-------|------|------|------|------|-------|-------|-------|-------|------|
| 18.99 | 16.87 | 13.72 | 10.39 | 7.76 | 6.55 | 7.08 | 9.21 | 12.36 | 15.69 | 18.31 | 19.52 | (67) |
|-------|-------|-------|-------|------|------|------|------|-------|-------|-------|-------|------|

Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

| | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| 213.06 | 215.27 | 209.70 | 197.84 | 182.86 | 168.79 | 159.39 | 157.18 | 162.75 | 174.61 | 189.58 | 203.66 | (68) |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

| | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 35.02 | 35.02 | 35.02 | 35.02 | 35.02 | 35.02 | 35.02 | 35.02 | 35.02 | 35.02 | 35.02 | 35.02 | (69) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

Pump and fan gains (Table 5a)

| | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | (70) |
|------|------|------|------|------|------|------|------|------|------|------|------|------|

Losses e.g. evaporation (Table 5)

| | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| -96.14 | -96.14 | -96.14 | -96.14 | -96.14 | -96.14 | -96.14 | -96.14 | -96.14 | -96.14 | -96.14 | -96.14 | (71) |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

Water heating gains (Table 5)

| | | | | | | | | | | | | |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 101.49 | 99.38 | 95.00 | 89.05 | 85.18 | 79.74 | 75.12 | 81.04 | 83.15 | 89.31 | 96.27 | 99.39 | (72) |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

| | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| 392.59 | 390.57 | 377.47 | 356.32 | 334.86 | 314.14 | 300.64 | 306.48 | 317.31 | 338.67 | 363.22 | 381.62 | (73) |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

6. Solar gains

Access factor
Table 6d

Area
m²

Solar flux
W/m²

g
specific data
or Table 6b

FF
specific data
or Table 6c

Gains
W

NorthEast 0.77 x 14.88 x 11.28 x 0.9 x 0.50 x 0.80 = 46.54 (75)

NorthWest 0.77 x 11.16 x 11.28 x 0.9 x 0.50 x 0.80 = 34.90 (81)

Solar gains in watts $\Sigma(74)m...(82)m$

| | | | | | | | | | | | | |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|------|
| 81.44 | 165.78 | 298.68 | 490.52 | 659.36 | 702.95 | 657.59 | 524.24 | 363.95 | 202.60 | 102.48 | 66.51 | (83) |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|------|

Total gains - internal and solar (73)m + (83)m

| | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|------|
| 474.04 | 556.35 | 676.15 | 846.85 | 994.23 | 1017.09 | 958.24 | 830.73 | 681.26 | 541.26 | 465.69 | 448.13 | (84) |
|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|------|

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(°C) 21.00 (85)

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

Utilisation factor for gains for living area n1,m (see Table 9a)

| | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1.00 | 0.99 | 0.96 | 0.79 | 0.55 | 0.36 | 0.27 | 0.32 | 0.58 | 0.92 | 0.99 | 1.00 | (86) |
|------|------|------|------|------|------|------|------|------|------|------|------|------|

Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

| | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 20.30 | 20.45 | 20.71 | 20.94 | 21.00 | 21.00 | 21.00 | 21.00 | 20.99 | 20.85 | 20.53 | 20.27 | (87) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)

| | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 20.27 | 20.27 | 20.27 | 20.28 | 20.28 | 20.30 | 20.30 | 20.30 | 20.29 | 20.28 | 20.28 | 20.27 | (88) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

Utilisation factor for gains for rest of dwelling n2,m

| | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1.00 | 0.99 | 0.94 | 0.76 | 0.51 | 0.32 | 0.22 | 0.27 | 0.53 | 0.90 | 0.99 | 1.00 | (89) |
|------|------|------|------|------|------|------|------|------|------|------|------|------|

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

| | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 19.32 | 19.55 | 19.91 | 20.22 | 20.28 | 20.30 | 20.30 | 20.30 | 20.29 | 20.12 | 19.66 | 19.29 | (90) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

Living area fraction

Living area ÷ (4) = 0.59 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

| | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 19.90 | 20.08 | 20.38 | 20.64 | 20.70 | 20.71 | 20.71 | 20.71 | 20.70 | 20.55 | 20.17 | 19.87 | (92) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

Apply adjustment to the mean internal temperature from Table 4e where appropriate

| | | | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 19.90 | 20.08 | 20.38 | 20.64 | 20.70 | 20.71 | 20.71 | 20.71 | 20.70 | 20.55 | 20.17 | 19.87 | (93) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

8. Space heating requirement

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

Utilisation factor for gains, ηm

| | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1.00 | 0.99 | 0.95 | 0.77 | 0.53 | 0.35 | 0.25 | 0.30 | 0.56 | 0.91 | 0.99 | 1.00 | (94) |
|------|------|------|------|------|------|------|------|------|------|------|------|------|

Useful gains, ηmGm, W (94)m x (84)m

| | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| 471.98 | 549.22 | 639.28 | 655.07 | 526.85 | 353.20 | 237.67 | 248.38 | 381.72 | 491.25 | 460.38 | 446.75 | (95) |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

Monthly average external temperature from Table U1

| | | | | | | | | | | | | |
|------|------|------|------|-------|-------|-------|-------|-------|-------|------|------|------|
| 4.30 | 4.90 | 6.50 | 8.90 | 11.70 | 14.60 | 16.60 | 16.40 | 14.10 | 10.60 | 7.10 | 4.20 | (96) |
|------|------|------|------|-------|-------|-------|-------|-------|-------|------|------|------|

Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]

| | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| 943.69 | 915.35 | 833.97 | 693.65 | 529.78 | 353.32 | 237.68 | 248.40 | 384.60 | 585.75 | 774.75 | 935.22 | (97) |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m

| | | | | | | | | | | | | |
|--------|--------|--------|-------|------|------|------|------|------|-------|-----------------------|---------|------|
| 350.96 | 246.04 | 144.85 | 27.78 | 2.18 | 0.00 | 0.00 | 0.00 | 0.00 | 70.30 | 226.35 | 363.42 | |
| | | | | | | | | | | Σ(98)1...5, 10...12 = | 1431.89 | (98) |

Space heating requirement kWh/m²/year

(98) ÷ (4) 18.60 (99)

8c. Space cooling requirement

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

Heat loss rate Lm

| | | | | | | | | | | | | |
|------|------|------|------|------|--------|--------|--------|------|------|------|------|-------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 543.57 | 427.92 | 437.91 | 0.00 | 0.00 | 0.00 | 0.00 | (100) |
|------|------|------|------|------|--------|--------|--------|------|------|------|------|-------|

Utilisation factor for loss ηm

| | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | (101) |
|------|------|------|------|------|------|------|------|------|------|------|------|-------|

Useful loss ηmLm (watts) (100)m x (101)m

| | | | | | | | | | | | | |
|------|------|------|------|------|--------|--------|--------|------|------|------|------|-------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 542.86 | 427.74 | 437.44 | 0.00 | 0.00 | 0.00 | 0.00 | (102) |
|------|------|------|------|------|--------|--------|--------|------|------|------|------|-------|

Gains

| | | | | | | | | | | | | |
|------|------|------|------|------|---------|---------|---------|------|------|------|------|-------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1269.58 | 1199.23 | 1051.30 | 0.00 | 0.00 | 0.00 | 0.00 | (103) |
|------|------|------|------|------|---------|---------|---------|------|------|------|------|-------|

Space cooling requirement, whole dwelling, continuous (kWh) 0.024 x [(103)m - (102)m] x (41)m

| | | | | | | | | | | | | |
|------|------|------|------|------|--------|--------|--------|------|------|---------------|---------|-------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 523.24 | 573.99 | 456.71 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | | | | | | | | | | Σ(104)6...8 = | 1553.94 | (104) |

Cooled fraction

cooled area ÷ (4) = 1.00 (105)

Intermittency factor (Table 10)

| | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|---------------|------|-------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.25 | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | | | | | | | | | | Σ(106)6...8 = | 0.75 | (106) |

Space cooling requirement (104)m x (105) x (106)m

| | | | | | | | | | | | | |
|------|------|------|------|------|--------|--------|--------|------|------|------|------|--|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 130.81 | 143.50 | 114.18 | 0.00 | 0.00 | 0.00 | 0.00 | |
|------|------|------|------|------|--------|--------|--------|------|------|------|------|--|

| | | | |
|--|------------------------|--------|-------|
| | $\Sigma(107)6\dots8 =$ | 388.49 | (107) |
| Space cooling requirement kWh/m ² /year | $(107) \div (4) =$ | 5.05 | (108) |

9b. Energy requirements - community heating scheme

| | | | |
|--|-------------------------|------|--------|
| Fraction of space heat from secondary/supplementary system (table 11) | '0' if none | 0.00 | (301) |
| Fraction of space heat from community system | $1 - (301) =$ | 1.00 | (302) |
| Fraction of community heat from boilers | | 1.00 | (303a) |
| Fraction of total space heat from community boilers | $(302) \times (303a) =$ | 1.00 | (304a) |
| Factor for control and charging method (Table 4c(3)) for community space heating | | 1.00 | (305) |
| Factor for charging method (Table 4c(3)) for community water heating | | 1.00 | (305a) |
| Distribution loss factor (Table 12c) for community heating system | | 1.05 | (306) |

Space heating

| | | |
|----------------------------------|--|----------------|
| Annual space heating requirement | 1431.89 | (98) |
| Space heat from boilers | $(98) \times (304a) \times (305) \times (306) =$ | 1503.48 (307a) |

Water heating

| | | |
|--|---|----------------|
| Annual water heating requirement | 1818.85 | (64) |
| Water heat from boilers | $(64) \times (303a) \times (305a) \times (306) =$ | 1909.79 (310a) |
| Electricity used for heat distribution | $0.01 \times [(307a)\dots(307e) + (310a)\dots(310e)] =$ | 34.13 (313) |

| | | | |
|--|--|----------------------|--------------|
| Cooling System Energy Efficiency Ratio | | 3.78 | (314) |
| Space cooling (if there is a fixed cooling system, if not enter 0) | | $(107) \div (314) =$ | 102.77 (315) |
| Electricity for pumps, fans and electric keep-hot (Table 4f) | | | |
| mechanical ventilation fans - balanced, extract or positive input from outside | 185.65 | | (330a) |
| Total electricity for the above, kWh/year | | 185.65 | (331) |
| Electricity for lighting (Appendix L) | | 335.44 | (332) |
| Total delivered energy for all uses | $(307) + (309) + (310) + (312) + (315) + (331) + (332)\dots(337b) =$ | 4037.13 | (338) |

10b. Fuel costs - community heating scheme

| | Fuel kWh/year | | Fuel price | | Fuel cost £/year | |
|-----------------------------|------------------|---|------------|---|---------------------|--------|
| Space heating from boilers | 1503.48 | x | 4.24 | x 0.01 = | 63.75 | (340a) |
| Water heating from boilers | 1909.79 | x | 4.24 | x 0.01 = | 80.98 | (342a) |
| Space cooling | 102.77 | x | 13.19 | x 0.01 = | 13.56 | (348) |
| Pumps and fans | 185.65 | x | 13.19 | x 0.01 = | 24.49 | (349) |
| Electricity for lighting | 335.44 | x | 13.19 | x 0.01 = | 44.24 | (350) |
| Additional standing charges | | | | | 120.00 | (351) |
| Total energy cost | | | | $(340a)\dots(342e) + (345)\dots(354) =$ | 347.01 | (355) |

11b. SAP rating - community heating scheme

| | | |
|---------------------------------|-------|-------|
| Energy cost deflator (Table 12) | 0.42 | (356) |
| Energy cost factor (ECF) | 1.19 | (357) |
| SAP value | 83.33 | |
| SAP rating (section 13) | 83 | (358) |
| SAP band | B | |

12b. CO₂ emissions - community heating scheme

| Energy kWh/year | Emission factor | Emissions (kg/year) |
|--------------------|-----------------|------------------------|
|--------------------|-----------------|------------------------|

Emissions from other sources (space heating)

| | | | | | | |
|---|--|---------|-------|-------|----------------|---------------|
| Efficiency of boilers | 93.20 | | | | | (367a) |
| CO2 emissions from boilers | $[(307a)+(310a)] \times 100 \div (367a) =$ | 3662.31 | x | 0.216 | = | 791.06 (367) |
| Electrical energy for community heat distribution | 34.13 | x | 0.519 | = | 17.71 | (372) |
| Total CO2 associated with community systems | | | | | 808.77 | (373) |
| Total CO2 associated with space and water heating | | | | | 808.77 | (376) |
| Space cooling | 102.77 | x | 0.519 | = | 53.34 | (377) |
| Pumps and fans | 185.65 | x | 0.519 | = | 96.35 | (378) |
| Electricity for lighting | 335.44 | x | 0.519 | = | 174.09 | (379) |
| Total CO ₂ , kg/year | | | | | (376)..(382) = | 1132.56 (383) |
| Dwelling CO ₂ emission rate | | | | | (383) ÷ (4) = | 14.71 (384) |
| EI value | | | | | 87.56 | |
| EI rating (section 14) | | | | | 88 | (385) |
| EI band | | | | | B | |

13b. Primary energy - community heating scheme

| | Energy kWh/year | | Primary factor | | Primary energy (kWh/year) | |
|--|--|---------|----------------|------|------------------------------|---------------|
| Primary energy from other sources (space heating) | | | | | | |
| Efficiency of boilers | 93.20 | | | | | (367a) |
| Primary energy from boilers | $[(307a)+(310a)] \times 100 \div (367a) =$ | 3662.31 | x | 1.22 | = | 4468.01 (367) |
| Electrical energy for community heat distribution | 34.13 | x | 3.07 | = | 104.79 | (372) |
| Total primary energy associated with community systems | | | | | 4572.80 | (373) |
| Total primary energy associated with space and water heating | | | | | 4572.80 | (376) |
| Space cooling | 102.77 | x | 3.07 | = | 315.52 | (377) |
| Pumps and fans | 185.65 | x | 3.07 | = | 569.94 | (378) |
| Electricity for lighting | 335.44 | x | 3.07 | = | 1029.81 | (379) |
| Primary energy kWh/year | | | | | 6488.07 | (383) |
| Dwelling primary energy rate kWh/m ² /year | | | | | 84.26 | (384) |