

## SAP WorkSheet: New dwelling design stage

### User Details

**Assessor Name:** Nicholas Jones **Stroma Number:** STRO000971  
**Software Name:** Stroma FSAP 2012 **Software Version:** Version: 1.0.4.18

### Property Address: Plot 17

**Address :** Plot 17, Cinders Road, Yapton, BN18 0JJ

### 1. General dwelling dimensions

|                                                           | Area(m <sup>2</sup> ) |   | Av. Height(m) |                                      | Volume(m <sup>3</sup> ) |
|-----------------------------------------------------------|-----------------------|---|---------------|--------------------------------------|-------------------------|
| Ground floor                                              | 29.08 (1a)            | x | 2.37 (2a)     | =                                    | 68.92 (3a)              |
| First floor                                               | 46.81 (1b)            | x | 2.55 (2b)     | =                                    | 119.37 (3b)             |
| Second floor                                              | 46.81 (1c)            | x | 2.55 (2c)     | =                                    | 119.37 (3c)             |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n) | 122.7 (4)             |   |               |                                      |                         |
| Dwelling volume                                           |                       |   |               | (3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) = | 307.65 (5)              |

### 2. Ventilation rate

|                              | main heating |   | secondary heating |   | other |   | total |        | m <sup>3</sup> per hour |
|------------------------------|--------------|---|-------------------|---|-------|---|-------|--------|-------------------------|
| Number of chimneys           | 0            | + | 0                 | + | 0     | = | 0     | x 40 = | 0 (6a)                  |
| Number of open flues         | 0            | + | 0                 | + | 0     | = | 0     | x 20 = | 0 (6b)                  |
| Number of intermittent fans  |              |   |                   |   |       |   | 5     | x 10 = | 50 (7a)                 |
| Number of passive vents      |              |   |                   |   |       |   | 0     | x 10 = | 0 (7b)                  |
| Number of flueless gas fires |              |   |                   |   |       |   | 0     | x 40 = | 0 (7c)                  |

### Air changes per hour

|                                                                                                                                                 |  |                                                        |                                |                  |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------|--------------------------------|------------------|------|
| Infiltration due to chimneys, flues and fans = $\{6a\} + \{6b\} + \{7a\} + \{7b\} + \{7c\} =$                                                   |  | 50                                                     | $\div \{5\} =$                 | 0.16             | (8)  |
| If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)                              |  |                                                        |                                |                  |      |
| Number of storeys in the dwelling (ns)                                                                                                          |  |                                                        |                                | 0                | (9)  |
| Additional infiltration                                                                                                                         |  |                                                        | $\{ \{9\} - 1 \} \times 0.1 =$ | 0                | (10) |
| Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction                                                        |  |                                                        |                                | 0                | (11) |
| if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 |  |                                                        |                                |                  |      |
| If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0                                                                   |  |                                                        |                                | 0                | (12) |
| If no draught lobby, enter 0.05, else enter 0                                                                                                   |  |                                                        |                                | 0                | (13) |
| Percentage of windows and doors draught stripped                                                                                                |  |                                                        |                                | 0                | (14) |
| Window infiltration                                                                                                                             |  | $0.25 - \{ 0.2 \times \{14\} \div 100 \} =$            |                                | 0                | (15) |
| Infiltration rate                                                                                                                               |  | $\{8\} + \{10\} + \{11\} + \{12\} + \{13\} + \{15\} =$ |                                | 0                | (16) |
| Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area                                               |  |                                                        |                                | 5.09999990463257 | (17) |
| If based on air permeability value, then $\{18\} = [\{17\} \div 20] + \{8\}$ , otherwise $\{18\} = \{16\}$                                      |  |                                                        |                                | 0.42             | (18) |
| Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used                                |  |                                                        |                                |                  |      |
| Number of sides sheltered                                                                                                                       |  |                                                        |                                | 2                | (19) |
| Shelter factor                                                                                                                                  |  | $\{20\} = 1 - \{ 0.075 \times \{19\} \} =$             |                                | 0.85             | (20) |
| Infiltration rate incorporating shelter factor                                                                                                  |  | $\{21\} = \{18\} \times \{20\} =$                      |                                | 0.35             | (21) |
| Infiltration rate modified for monthly wind speed                                                                                               |  |                                                        |                                |                  |      |

Monthly average wind speed from Table 7

|        |     |   |     |     |     |     |     |     |   |     |     |     |
|--------|-----|---|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|
| (22)m= | 5.1 | 5 | 4.9 | 4.4 | 4.3 | 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 |
|--------|-----|---|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|





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Water storage loss calculated for each month

$$\{(56)\}m = \{(55)\} \times \{(41)\}m$$

|        |      |       |      |       |      |       |      |      |       |      |       |      |      |
|--------|------|-------|------|-------|------|-------|------|------|-------|------|-------|------|------|
| {56}m= | 22.1 | 19.96 | 22.1 | 21.38 | 22.1 | 21.38 | 22.1 | 22.1 | 21.38 | 22.1 | 21.38 | 22.1 | {56} |
|--------|------|-------|------|-------|------|-------|------|------|-------|------|-------|------|------|

If cylinder contains dedicated solar storage,  $\{(57)\}m = \{(56)\}m \times [(\{(50)\} - (H11)) \div \{(50)\}]$ , else  $\{(57)\}m = \{(56)\}m$  where (H11) is from Appendix H

|        |      |       |      |       |      |       |      |      |       |      |       |      |      |
|--------|------|-------|------|-------|------|-------|------|------|-------|------|-------|------|------|
| {57}m= | 22.1 | 19.96 | 22.1 | 21.38 | 22.1 | 21.38 | 22.1 | 22.1 | 21.38 | 22.1 | 21.38 | 22.1 | {57} |
|--------|------|-------|------|-------|------|-------|------|------|-------|------|-------|------|------|

Primary circuit loss (annual) from Table 3

0

{58}

Primary circuit loss calculated for each month  $\{(59)\}m = \{(58)\} \div 365 \times \{(41)\}m$

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

|        |       |       |       |       |       |       |       |       |       |       |       |       |      |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| {59}m= | 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 calculated for each month  $\{(61)\}m = \{(60)\} \div 365 \times \{(41)\}m$

|        |   |   |   |   |   |   |   |   |   |   |   |   |      |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|------|
| {61}m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | {61} |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|------|

Total heat required for water heating calculated for each month  $\{(62)\}m = 0.85 \times \{(45)\}m + \{(46)\}m + \{(57)\}m + \{(59)\}m + \{(61)\}m$

|        |        |        |        |        |        |        |        |        |        |        |        |        |      |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| {62}m= | 212.46 | 187.12 | 196.17 | 175.38 | 171.52 | 152.76 | 146.24 | 161.12 | 161.04 | 181.88 | 192.92 | 207.19 | {62} |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

|        |   |   |   |   |   |   |   |   |   |   |   |   |      |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|------|
| {63}m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | {63} |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|------|

Output from water heater

|                                               |        |        |        |        |        |        |        |        |        |        |        |         |      |
|-----------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|------|
| {64}m=                                        | 212.46 | 187.12 | 196.17 | 175.38 | 171.52 | 152.76 | 146.24 | 161.12 | 161.04 | 181.88 | 192.92 | 207.19  |      |
| Output from water heater (annual) $\times 12$ |        |        |        |        |        |        |        |        |        |        |        | 2145.81 | {64} |

Heat gains from water heating, kWh/month  $0.25 \times [0.85 \times \{(45)\}m + \{(61)\}m] + 0.8 \times [(\{(46)\}m + \{(57)\}m + \{(59)\}m)]$

|        |       |       |       |       |       |       |       |       |       |       |       |      |      |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| {65}m= | 91.85 | 81.37 | 86.43 | 78.83 | 78.24 | 71.32 | 69.83 | 74.78 | 74.07 | 81.68 | 84.67 | 90.1 | {65} |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|

include  $\{(57)\}m$  in calculation of  $\{(65)\}m$  only if cylinder is in the dwelling or hot water is from community heating

### 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= | 172.39 | 172.39 | 172.39 | 172.39 | 172.39 | 172.39 | 172.39 | 172.39 | 172.39 | 172.39 | 172.39 | 172.39 | {66} |

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

|        |    |       |       |       |       |       |       |      |       |       |       |      |      |
|--------|----|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|------|------|
| {67}m= | 65 | 57.73 | 46.95 | 35.54 | 26.57 | 22.43 | 24.24 | 31.5 | 42.29 | 53.69 | 62.67 | 66.8 | {67} |
|--------|----|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|------|------|

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

|        |        |        |        |        |        |        |        |        |        |        |        |        |      |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| {68}m= | 430.88 | 435.35 | 424.08 | 400.09 | 369.82 | 341.36 | 322.35 | 317.88 | 329.14 | 353.13 | 383.41 | 411.87 | {68} |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

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

|        |       |       |       |       |       |       |       |       |       |       |       |       |      |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| {69}m= | 55.11 | 55.11 | 55.11 | 55.11 | 55.11 | 55.11 | 55.11 | 55.11 | 55.11 | 55.11 | 55.11 | 55.11 | {69} |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|

Pumps and fans gains (Table 5a)

|        |   |   |   |   |   |   |   |   |   |   |   |   |      |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|------|
| {70}m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | {70} |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|------|

Losses e.g. evaporation (negative values) (Table 5)

|        |         |         |         |         |         |         |         |         |         |         |         |         |      |
|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| {71}m= | -114.93 | -114.93 | -114.93 | -114.93 | -114.93 | -114.93 | -114.93 | -114.93 | -114.93 | -114.93 | -114.93 | -114.93 | {71} |
|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|

Water heating gains (Table 5)

|        |        |        |        |        |        |       |       |        |        |        |        |       |      |
|--------|--------|--------|--------|--------|--------|-------|-------|--------|--------|--------|--------|-------|------|
| {72}m= | 123.45 | 121.09 | 116.17 | 109.49 | 105.16 | 99.05 | 93.86 | 100.51 | 102.87 | 109.79 | 117.59 | 121.1 | {72} |
|--------|--------|--------|--------|--------|--------|-------|-------|--------|--------|--------|--------|-------|------|

**Total internal gains =**  $\{(66)\}m + \{(67)\}m + \{(68)\}m + \{(69)\}m + \{(70)\}m + \{(71)\}m + \{(72)\}m$

|        |       |        |        |        |        |        |        |        |        |        |        |        |      |
|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| {73}m= | 731.9 | 726.74 | 699.78 | 657.71 | 614.12 | 575.41 | 553.02 | 562.47 | 586.88 | 629.18 | 676.24 | 712.34 | {73} |
|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|

### 6 Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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| Orientation: |      | Access Factor<br>Table 6d |   | Area<br>m² |   | Flux<br>Table 6a |   | g_<br>Table 6b |   | FF<br>Table 6c |   | Gains<br>(W) |      |
|--------------|------|---------------------------|---|------------|---|------------------|---|----------------|---|----------------|---|--------------|------|
| North        | 0.9x | 0.77                      | x | 1.12       | x | 10.63            | x | 0.63           | x | 1.11           | = | 5.78         | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 20.32            | x | 0.63           | x | 1.11           | = | 11.04        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 34.53            | x | 0.63           | x | 1.11           | = | 18.76        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 55.46            | x | 0.63           | x | 1.11           | = | 30.13        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 74.72            | x | 0.63           | x | 1.11           | = | 40.59        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 79.99            | x | 0.63           | x | 1.11           | = | 43.46        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 74.68            | x | 0.63           | x | 1.11           | = | 40.57        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 59.25            | x | 0.63           | x | 1.11           | = | 32.19        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 41.52            | x | 0.63           | x | 1.11           | = | 22.56        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 24.19            | x | 0.63           | x | 1.11           | = | 13.14        | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 13.12            | x | 0.63           | x | 1.11           | = | 7.13         | (74) |
| North        | 0.9x | 0.77                      | x | 1.12       | x | 8.86             | x | 0.63           | x | 1.11           | = | 4.82         | (74) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 19.64            | x | 0.63           | x | 1.11           | = | 113.95       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 38.42            | x | 0.63           | x | 1.11           | = | 222.91       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 63.27            | x | 0.63           | x | 1.11           | = | 367.1        | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 92.28            | x | 0.63           | x | 1.11           | = | 535.39       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 113.09           | x | 0.63           | x | 1.11           | = | 656.14       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 115.77           | x | 0.63           | x | 1.11           | = | 671.68       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 110.22           | x | 0.63           | x | 1.11           | = | 639.46       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 94.68            | x | 0.63           | x | 1.11           | = | 549.29       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 73.59            | x | 0.63           | x | 1.11           | = | 426.95       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 45.59            | x | 0.63           | x | 1.11           | = | 264.5        | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 24.49            | x | 0.63           | x | 1.11           | = | 142.08       | (76) |
| East         | 0.9x | 0.77                      | x | 11.96      | x | 16.15            | x | 0.63           | x | 1.11           | = | 93.71        | (76) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 19.64            | x | 0.63           | x | 1.11           | = | 71.08        | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 38.42            | x | 0.63           | x | 1.11           | = | 139.04       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 63.27            | x | 0.63           | x | 1.11           | = | 228.98       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 92.28            | x | 0.63           | x | 1.11           | = | 333.95       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 113.09           | x | 0.63           | x | 1.11           | = | 409.27       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 115.77           | x | 0.63           | x | 1.11           | = | 418.96       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 110.22           | x | 0.63           | x | 1.11           | = | 398.86       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 94.68            | x | 0.63           | x | 1.11           | = | 342.62       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 73.59            | x | 0.63           | x | 1.11           | = | 266.31       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 45.59            | x | 0.63           | x | 1.11           | = | 164.98       | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 24.49            | x | 0.63           | x | 1.11           | = | 88.62        | (80) |
| West         | 0.9x | 0.77                      | x | 7.46       | x | 16.15            | x | 0.63           | x | 1.11           | = | 58.45        | (80) |

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m= 190.8 372.99 614.83 899.47 1106 1134.09 1078.9 924.1 715.81 442.62 237.83 156.97 (83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m= 922.71 1099.73 1314.61 1557.18 1720.12 1709.5 1631.92 1486.56 1302.69 1071.8 914.07 869.31 (84)



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|                                                                                                 | Jan                      | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec     | kWh/year      |
|-------------------------------------------------------------------------------------------------|--------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------------|
| Space heating requirement (calculated above)                                                    | 1221.05                  | 944.16 | 762.37 | 418.91 | 195.05 | 0      | 0      | 0      | 0      | 452.59 | 862.79 | 1248.36 |               |
| (211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$                                       | 347.7                    | 268.85 | 217.09 | 119.29 | 55.54  | 0      | 0      | 0      | 0      | 128.88 | 245.69 | 355.48  | (211)         |
| Total (kWh/year) = Sum(211) <sub>1,5,10,12</sub>                                                |                          |        |        |        |        |        |        |        |        |        |        |         | 1738.52 (211) |
| Space heating fuel (secondary), kWh/month<br>= $\{[(98)m \times (201)]\} \times 100 \div (208)$ | 0                        | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0       |               |
| (215)m =                                                                                        |                          |        |        |        |        |        |        |        |        |        |        |         | 0 (215)       |
| Total (kWh/year) = Sum(215) <sub>1,5,10,12</sub>                                                |                          |        |        |        |        |        |        |        |        |        |        |         |               |
| <b>Water heating</b>                                                                            |                          |        |        |        |        |        |        |        |        |        |        |         |               |
| Output from water heater (calculated above)                                                     | 212.46                   | 187.12 | 196.17 | 175.38 | 171.52 | 152.76 | 146.24 | 161.12 | 161.04 | 181.88 | 192.92 | 207.19  |               |
| Efficiency of water heater                                                                      |                          |        |        |        |        |        |        |        |        |        |        |         | 176.98 (216)  |
| (217)m =                                                                                        | 176.98                   | 176.98 | 176.98 | 176.98 | 176.98 | 176.98 | 176.98 | 176.98 | 176.98 | 176.98 | 176.98 | 176.98  | (217)         |
| Fuel for water heating, kWh/month<br>(219)m = (64)m x 100 ÷ (217)m                              | 120.05                   | 105.73 | 110.84 | 99.09  | 96.91  | 86.31  | 82.63  | 91.04  | 90.99  | 102.77 | 109    | 117.07  |               |
| (219)m =                                                                                        |                          |        |        |        |        |        |        |        |        |        |        |         | 1212.43 (219) |
| Total = Sum(219a) <sub>1,12</sub>                                                               |                          |        |        |        |        |        |        |        |        |        |        |         |               |
| <b>Annual totals</b>                                                                            |                          |        |        |        |        |        |        |        |        |        |        |         |               |
| Space heating fuel used, main system 1                                                          |                          |        |        |        |        |        |        |        |        |        |        |         | 1738.52       |
| Water heating fuel used                                                                         |                          |        |        |        |        |        |        |        |        |        |        |         | 1212.43       |
| Electricity for pumps, fans and electric keep-hot                                               |                          |        |        |        |        |        |        |        |        |        |        |         |               |
| Total electricity for the above, kWh/year                                                       | sum of (230a).. (230g) = |        |        |        |        |        |        |        |        |        |        |         | 0 (231)       |
| Electricity for lighting                                                                        |                          |        |        |        |        |        |        |        |        |        |        |         | 459.15 (232)  |

### 10a Fuel costs - individual heating systems

|                                                                                                                          | Fuel<br>kWh/year | Fuel Price<br>(Table 12) | Fuel Cost<br>£/year |
|--------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------|---------------------|
| Space heating - main system 1                                                                                            | (211) x          | 13.19                    | 229.31 (240)        |
| Space heating - main system 2                                                                                            | (213) x          | 0                        | 0 (241)             |
| Space heating - secondary                                                                                                | (215) x          | 13.19                    | 0 (242)             |
| Water heating cost (other fuel)                                                                                          | (219)            | 13.19                    | 159.92 (247)        |
| Pumps, fans and electric keep-hot                                                                                        | (231)            | 13.19                    | 0 (249)             |
| (if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a) |                  |                          |                     |
| Energy for lighting                                                                                                      | (232)            | 13.19                    | 60.56 (250)         |
| Additional standing charges (Table 12)                                                                                   |                  |                          | 120 (251)           |

Appendix Q items: repeat lines (253) and (254) as needed

|                          |                                 |              |
|--------------------------|---------------------------------|--------------|
| <b>Total energy cost</b> | (245)...(247) + (250)...(254) = | 569.79 (255) |
|--------------------------|---------------------------------|--------------|

### 11a SAP rating - individual heating systems

|                                 |            |
|---------------------------------|------------|
| Energy cost deflator (Table 12) | 0.42 (256) |
|---------------------------------|------------|

## SAP WorkSheet: New dwelling design stage

|                                |                                            |       |       |
|--------------------------------|--------------------------------------------|-------|-------|
| Energy cost factor (ECF)       | $[(255) \times (256)] \div [(4) + 45.0] =$ | 1.43  | (257) |
| <b>SAP rating (Section 12)</b> |                                            | 80.09 | (258) |

### 12a CO2 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)                     | (211) x                         | 0.519                         | = | 902.29                   | (261) |
| Space heating (secondary)                         | (215) x                         | 0.519                         | = | 0                        | (263) |
| Water heating                                     | (219) x                         | 0.216                         | = | 261.88                   | (264) |
| Space and water heating                           | (261) + (262) + (263) + (264) = |                               |   | 1164.17                  | (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x                         | 0.519                         | = | 0                        | (267) |
| Electricity for lighting                          | (232) x                         | 0.519                         | = | 238.3                    | (268) |
| Total CO2, kg/year                                |                                 | sum of (265)...(271) =        |   | 1402.47                  | (272) |
| <b>CO2 emissions per m²</b>                       |                                 | (272) ÷ (4) =                 |   | 11.43                    | (273) |
| El rating (section 14)                            |                                 |                               |   | 89                       | (274) |

### 13a Primary Energy

|                                                   | Energy<br>kWh/year              | Primary<br>factor      |   | P. Energy<br>kWh/year |       |
|---------------------------------------------------|---------------------------------|------------------------|---|-----------------------|-------|
| Space heating (main system 1)                     | (211) x                         | 3.07                   | = | 5337.25               | (261) |
| Space heating (secondary)                         | (215) x                         | 3.07                   | = | 0                     | (263) |
| Energy for water heating                          | (219) x                         | 1.22                   | = | 1479.16               | (264) |
| Space and water heating                           | (261) + (262) + (263) + (264) = |                        |   | 6816.41               | (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x                         | 3.07                   | = | 0                     | (267) |
| Electricity for lighting                          | (232) x                         | 0                      | = | 1409.6                | (268) |
| 'Total Primary Energy                             |                                 | sum of (265)...(271) = |   | 8226.01               | (272) |
| <b>Primary energy kWh/m²/year</b>                 |                                 | (272) ÷ (4) =          |   | 67.04                 | (273) |