Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:55:26

Project Information:

Assessed By: Zahid Ashraf (STRO001082) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 67.74m² Plot Reference: Site Reference : Hermitage Lane Plot 2

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.88 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.81 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 43.6 kWh/m²

OK

2 Fabric U-values

Element Highest Average 0.15 (max. 0.70) External wall 0.14 (max. 0.30) OK Floor 0.12 (max. 0.25) 0.12 (max. 0.70) **OK** Roof 0.10 (max. 0.20) 0.10 (max. 0.35) OK **Openings** 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

No cylinder thermostat Hot water controls:

No cylinder

OK

Regulations Compliance Report

| - 1 P 12 | | |
|---|-------------------------|----|
| 7 Low energy lights | | |
| Percentage of fixed lights with low-energy fittings | 100.0% | |
| Minimum | 75.0% | OK |
| 8 Mechanical ventilation | | |
| Continuous supply and extract system | | |
| Specific fan power: | 0.91 | |
| Maximum | 1.5 | OK |
| MVHR efficiency: | 93% | |
| Minimum | 70% | OK |
| 9 Summertime temperature | | |
| Overheating risk (Thames valley): | Medium | oK |
| Based on: | | |
| Overshading: | Average or unknown | |
| Windows facing: South West | 8.65m ² | |
| Ventilation rate: | 4.00 | |
| 10 Key features | | |
| Air permeablility | 3.0 m³/m²h | |
| Roofs U-value | 0.1 W/m ² K | |
| External Walls U-value | 0.13 W/m ² K | |
| Floors U-value | 0.12 W/m ² K | |
| Community heating, heat from boilers – mains gas Photovoltaic array | | |

| User Details: | | | | | | | | | | | | |
|--|--------------|--|--|--|--|--|--|--|--|--|--|--|
| Assessor Name: Zahid Ashraf Stroma Number: STRO001 Software Name: Stroma FSAP 2012 Software Version: Version: 1 | | | | | | | | | | | | |
| Property Address: Plot 2 Address: | | | | | | | | | | | | |
| 1. Overall dwelling dimensions: | | | | | | | | | | | | |
| Š | olume(m³) | | | | | | | | | | | |
| Ground floor 67.74 (1a) x 2.5 (2a) = | 169.35 (3a) | | | | | | | | | | | |
| Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 67.74 (4) | | | | | | | | | | | | |
| Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ | 169.35 (5) | | | | | | | | | | | |
| 2. Ventilation rate: | | | | | | | | | | | | |
| main secondary other total n heating heating | n³ per hour | | | | | | | | | | | |
| Number of chimneys $0 + 0 = 0 \times 40 =$ | 0 (6a) | | | | | | | | | | | |
| Number of open flues $0 + 0 + 0 = 0 \times 20 =$ | 0 (6b) | | | | | | | | | | | |
| Number of intermittent fans 0 x 10 = | 0 (7a) | | | | | | | | | | | |
| Number of passive vents 0 x 10 = | 0 (7b) | | | | | | | | | | | |
| Number of flueless gas fires 0 × 40 = | 0 (7c) | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Air chanç | ges per hour | | | | | | | | | | | |
| Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0 \div (5) =$ | 0 (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]x0.1 = | 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 | 3 (17) | | | | | | | | | | | |
| If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used | 0.15 (18) | | | | | | | | | | | |
| Number of sides sheltered | 2 (19) | | | | | | | | | | | |
| Shelter factor (20) = 1 - [0.075 x (19)] = | 0.85 (20) | | | | | | | | | | | |
| Infiltration rate incorporating shelter factor (21) = (18) x (20) = | 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 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 | | | | | | | | | | | | |
| Wind Factor (22a)m = (22)m ÷ 4 | | | | | | | | | | | | |
| Willia Factor (22a)III = $(22a)III = 4$ | | | | | | | | | | | | |

| Adjusted infiltr | ation rat | e (allowi | ng for sh | nelter an | d wind s | peed) = | (21a) x | (22a)m | | | | | |
|---|--------------|------------|-------------|-------------|----------------|-------------|----------------|-------------|--------------|---------------------------|-------------------|------------------|--|
| 0.16 | 0.16 | 0.16 | 0.14 | 0.14 | 0.12 | 0.12 | 0.12 | 0.13 | 0.14 | 0.14 | 0.15 | | |
| Calculate effe If mechanic | | _ | rate for t | he appli | cable ca | se | | | | | | 0.5 | (23 |
| If exhaust air h | | | endix N. (2 | 3b) = (23a | a) × Fmv (e | eguation (I | N5)) othe | wise (23h |) = (23a) | | | 0.5 | (23 |
| If balanced with | | 0 | | , , | , | . , | ,, . | , | (200) | | | 0.5 | = ' |
| a) If balance | | • | • | J | | , | | • | 2h\m + (| 23P) ^ [| 1 _ (23c) | 79.05 | (2: |
| 24a)m= 0.27 | 0.26 | 0.26 | 0.25 | 0.24 | 0.23 | 0.23 | 0.22 | 0.23 | 0.24 | 0.25 | 0.25 |] | (2 |
| b) If balance | <u> </u> | ļ | <u> </u> | | l | <u> </u> | ļ | | <u>Į</u> | ļ. | 0.20 | J | ` |
| 24b)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | (2 |
| c) If whole h | <u> </u> | | | | | | | | | | | l | • |
| • | | < (23b), t | | • | • | | | | .5 × (23b | o) | | | |
| 24c)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (2 |
| d) If natural | ventilati | on or wh | ole hous | e positiv | e input | ventilatio | on from I | oft | | ! | | • | |
| if (22b)r | n = 1, th | en (24d) | m = (22l | o)m othe | rwise (2 | 4d)m = | 0.5 + [(2 | 2b)m² x | 0.5] | | | , | |
| 24d)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (2 |
| Effective air | change | rate - er | nter (24a |) or (24k | o) or (24 | c) or (24 | d) in box | (25) | | | | 1 | |
| 25)m= 0.27 | 0.26 | 0.26 | 0.25 | 0.24 | 0.23 | 0.23 | 0.22 | 0.23 | 0.24 | 0.25 | 0.25 | | (2 |
| 3. Heat losse | s and he | eat loss p | paramet | er: | | | | | | | | | |
| LEMENT | Gros area | | Openin | | Net Ar A ,r | | U-valı W/m2 | | A X U (W/ | | k-value kJ/m²- | | X k J/K |
| oors | | () | | | 2 | x | 1.4 | | 2.8 | $\stackrel{\prime}{\Box}$ | | | (2 |
| Vindows | | | | | 8.651 | x1 | /[1/(1.4)+ | 0.04] = | 11.47 | = | | | (2 |
| loor | | | | | 67.73 | _ | 0.12 | | 8.12867 | | | | _ _(2 |
| Valls Type1 | 50.9 | 00 | 8.65 | | 42.34 | _ | 0.12 | | 6.35 | <u></u> | | | —\(\^{-} |
| Valls Type2 | 21.2 | | 2 | _ | 19.26 | _ | 0.13 | | 2.76 | <u> </u> | | | —\(\^{-} |
| Valls Type3 | | | | = | | _ | | = | | 믁 ¦ | | | —\(\begin{array}{c} \cdot \\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ |
| Roof Type1 | 18.0 | | 0 | = | 18.02 | | 0.13 | ╣ . | 2.41 | | | | == |
| • • | 5.7 | | 0 | _ | 5.7 | × | 0.1 | = | 0.57 | | | | (3 |
| Roof Type2 | 4.1 | | 0 | | 4.12 | × | 0.1 | = | 0.41 | | | | (3 |
| otal area of e | | | | | 167.8 | | | /F/4/11 1 | \ 0.047 | | , | 0.0 | (3 |
| for windows and * include the area | | | | | | atea using | j tormula 1. | /[(1/U-vail | ie)+0.04] a | as given in | n paragrapr | 1 3.2 | |
| abric heat los | | | | · | | | (26)(30) | + (32) = | | | | 34.9 | (3 |
| leat capacity | Cm = S | (Axk) | | | | | | ((28). | (30) + (32 | 2) + (32a). | (32e) = | 8654.27 | (3 |
| hermal mass | parame | ter (TMF | P = Cm - | - TFA) ir | n kJ/m²K | | | Indica | itive Value | : Low | | 100 | (3 |
| or design assess an be used inste | | | | construct | ion are not | t known pr | ecisely the | indicative | e values of | TMP in T | able 1f | | |
| hermal bridge | es : S (L | x Y) cal | culated (| using Ap | pendix ł | < | | | | | | 13.2 | (3 |
| details of therma | al bridging | are not kn | own (36) = | = 0.05 x (3 | 1) | | | | | | | | |
| otal fabric he | at loss | | | | | | | (33) + | (36) = | | | 48.09 | (3 |
| entilation hea | at loss ca | alculated | monthly | / | | | | (38)m | = 0.33 × (| 25)m x (5 |) | 1 | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| 38)m= 14.94 | 14.76 | 14.58 | 13.69 | 13.51 | 12.62 | 12.62 | 12.44 | 12.98 | 13.51 | 13.87 | 14.23 | | (3 |
| leat transfer of | coefficie | nt, W/K | | | | | | (39)m | = (37) + (| 38)m | | | |
| 39)m= 63.03 | 62.86 | 62.68 | 61.79 | 61.61 | 60.72 | 60.72 | 60.54 | 61.07 | 61.61 | 61.96 | 62.32 | | |
| ======================================= | 2 Varaian | .1059/9 | SAP 9 92) | http://ww | w.stroma.d | com | | | Average = | Sum(39) | 112 /12= | 61.7 ≱ ag | 2 0 (3 |

| Heat loss para | ımeter (I | HLP), W | ′m²K | | | | | (40)m | = (39)m ÷ | · (4) | | | |
|--|-----------------------|-------------|-------------|----------------|-------------|------------|-------------|-----------------------|-------------|------------------------|----------|---------|-------|
| (40)m= 0.93 | 0.93 | 0.93 | 0.91 | 0.91 | 0.9 | 0.9 | 0.89 | 0.9 | 0.91 | 0.91 | 0.92 | | |
| | | | | | | l | l | | Average = | Sum(40) ₁ . | 12 /12= | 0.91 | (40) |
| Number of day | 1 | nth (Tab | le 1a) | | | | | ı | 1 | i | | | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (41)m= 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | | (41) |
| | | | | | | | | | | | | | |
| 4. Water heat | ting ene | rgy requi | rement: | | | | | | | | kWh/ye | ear: | |
| Assumed occu if TFA > 13.9 if TFA £ 13.9 | 9, N = 1 | | [1 - exp | (-0.0003 | 349 x (TF | FA -13.9 |)2)] + 0.0 | 0013 x (⁻ | TFA -13 | | 19 | | (42) |
| Annual averag Reduce the annua not more that 125 | al average | hot water | usage by | 5% if the a | welling is | designed t | | | se target o | | .75 | | (43) |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Hot water usage in | | | | , | | | | *F | | | | | |
| (44)m= 99.83 | 96.2 | 92.57 | 88.94 | 85.31 | 81.68 | 81.68 | 85.31 | 88.94 | 92.57 | 96.2 | 99.83 | | |
| | | | | | | | | | Total = Su | m(44) ₁₁₂ = | | 1089 | (44) |
| Energy content of | hot water | used - cal | culated mo | onthly $= 4$. | 190 x Vd,r | n x nm x C | OTm / 3600 |) kWh/mor | nth (see Ta | ables 1b, 1 | c, 1d) | | |
| (45)m= 148.04 | 129.47 | 133.61 | 116.48 | 111.77 | 96.45 | 89.37 | 102.56 | 103.78 | 120.95 | 132.02 | 143.37 | | _ |
| If instantaneous w | vater heati | na at noint | of use (no | hot water | etoraga) | enter∩in | hoves (16 | | Total = Su | m(45) ₁₁₂ = | = | 1427.85 | (45) |
| | | · · | , | | | | · · · | , , , - | | | | | (40) |
| (46)m= 22.21 Water storage | 19.42 loss: | 20.04 | 17.47 | 16.76 | 14.47 | 13.41 | 15.38 | 15.57 | 18.14 | 19.8 | 21.51 | | (46) |
| Storage volum | |) includir | ig any so | olar or W | /WHRS | storage | within sa | ame ves | sel | | 0 | | (47) |
| If community h | neating a | and no ta | nk in dw | elling, e | nter 110 | litres in | (47) | | | | | | |
| Otherwise if no | o stored | hot wate | er (this in | icludes i | nstantar | neous co | mbi boil | ers) ente | er '0' in (| 47) | | | |
| Water storage | | | | | | | | | | | | | |
| a) If manufact | | | | or is kno | wn (kWh | n/day): | | | | | 0 | | (48) |
| Temperature f | | | | | | | | | | | 0 | | (49) |
| Energy lost fro | | • | | | or io not | | (48) x (49) |) = | | 1 | 10 | | (50) |
| b) If manufactHot water stora | | | - | | | | | | | 0 | 02 | | (51) |
| If community h | - | | | - (| ., | -77 | | | | <u>_</u> | <u> </u> | | (5.7) |
| Volume factor | from Ta | ble 2a | | | | | | | | 1. | 03 | | (52) |
| Temperature f | actor fro | m Table | 2b | | | | | | | 0 | .6 | | (53) |
| Energy lost fro | | _ | , kWh/ye | ear | | | (47) x (51) |) x (52) x (| 53) = | 1. | 03 | | (54) |
| Enter (50) or (| (54) in (| 55) | | | | | | | | 1. | 03 | | (55) |
| Water storage | loss cal | culated f | or each | month | _ | | ((56)m = (| (55) × (41) | m | | | | |
| (56)m= 32.01 | 28.92 | 32.01 | 30.98 | 32.01 | 30.98 | 32.01 | 32.01 | 30.98 | 32.01 | 30.98 | 32.01 | | (56) |
| If cylinder contains | s dedicate | d solar sto | rage, (57)ı | m = (56)m | x [(50) – (| H11)] ÷ (5 | 0), else (5 | 7)m = (56) | m where (| H11) is fro | m Append | ix H | |
| (57)m= 32.01 | 28.92 | 32.01 | 30.98 | 32.01 | 30.98 | 32.01 | 32.01 | 30.98 | 32.01 | 30.98 | 32.01 | | (57) |
| Primary circuit | loss (ar | nnual) fro | m Table | 3 | _ | | | | | | 0 | | (58) |
| Primary circuit | ` | , | | | 59)m = (| (58) ÷ 36 | 65 × (41) | m | | | | | |
| (modified by | factor f | rom Tab | le H5 if t | here is s | olar wat | ter heatii | ng and a | cylinde | r thermo | stat) | | | |
| (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) <u>+</u> 3 | 65 v (41 |)m | | | | | | |
|-----------------------------------|------------|------------|-----------|-----------------|-----------------|-------------|----------------|------------|---------------|-------------|----------------------|----------------------------|
| (61)m= 0 0 | 0 | 0 | 0 | 00) - 3 | 00 x (41) |) 0 | 0 | 0 | T 0 | 0 | 1 | (61) |
| Total heat required for | water he | eating ca | alculated | l for eac | h month | <u> </u> | | | (46)m + | ļ |] · (59)m + (61)m | , , |
| (62)m= 203.31 179.4 | 188.88 | 169.98 | 167.04 | 149.94 | 144.65 | 157.8 | | 176.22 | 185.52 | 198.64 |] | (62) |
| Solar DHW input calculated | using Appe | endix G or | Appendix | L H (negati | ive quantity | /) (enter | '0' if no sola | r contribu | tion to wate | er heating) | 1 | |
| (add additional lines if | | | | | | | | | | 0, | | |
| (63)m= 0 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (63) |
| Output from water hea | ter | | | | ! | • | • | • | • | ! | • | |
| (64)m= 203.31 179.4 | 188.88 | 169.98 | 167.04 | 149.94 | 144.65 | 157.8 | 3 157.27 | 176.22 | 185.52 | 198.64 |] | |
| | | | | <u> </u> | | 0 | utput from w | ater heate | er (annual) | 112 | 2078.69 | (64) |
| Heat gains from water | heating, | kWh/mo | onth 0.2 | 5 ´ [0.85 | × (45)m | + (61) | m] + 0.8 x | k [(46)m | + (57)m | + (59)m | n] | |
| (65)m= 93.44 82.99 | 88.65 | 81.52 | 81.38 | 74.86 | 73.94 | 78.32 | 77.3 | 84.44 | 86.69 | 91.89 |] | (65) |
| include (57)m in cal | culation c | of (65)m | only if c | ylinder i | s in the | dwellin | g or hot w | ater is f | rom com | munity h | neating | |
| 5. Internal gains (see | e Table 5 | and 5a |): | | | | | | | | | |
| Metabolic gains (Table | e 5), Watt | s | | | | | | | | | | |
| Jan Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |] | |
| (66)m= 109.5 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 |] | (66) |
| Lighting gains (calcula | ted in Ap | pendix l | L, equat | ion L9 o | r L9a), a | lso se | e Table 5 | | | | - | |
| (67)m= 18.74 16.64 | 13.53 | 10.25 | 7.66 | 6.47 | 6.99 | 9.08 | 12.19 | 15.48 | 18.06 | 19.26 |] | (67) |
| Appliances gains (calc | ulated in | Append | dix L, eq | uation L | 13 or L1 | 3a), al | so see Ta | ble 5 | | _ | - | |
| (68)m= 191.96 193.96 | 188.94 | 178.25 | 164.76 | 152.08 | 143.61 | 141.6 | 146.64 | 157.33 | 170.82 | 183.49 |] | (68) |
| Cooking gains (calcula | ated in Ap | pendix | L, equat | ion L15 | or L15a |), also | see Table | 5 | - | | | |
| (69)m= 33.95 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 |] | (69) |
| Pumps and fans gains | (Table 5 | a) | | | | | | | | | _ | |
| (70)m= 0 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (70) |
| Losses e.g. evaporation | n (negat | ive valu | es) (Tab | le 5) | | | | | | | _ | |
| (71)m= -87.6 -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 |] | (71) |
| Water heating gains (| Table 5) | | | | | | | | | | _ | |
| (72)m= 125.6 123.5 | 119.15 | 113.23 | 109.39 | 103.98 | 99.38 | 105.2 | 7 107.36 | 113.49 | 120.41 | 123.51 |] | (72) |
| Total internal gains = | : | | | (66 |)m + (67)m | n + (68)r | n + (69)m + | (70)m + (7 | 71)m + (72) |)m | _ | |
| (73)m= 392.15 389.95 | 377.47 | 357.57 | 337.66 | 318.37 | 305.83 | 311.8 | 322.04 | 342.14 | 365.13 | 382.11 | | (73) |
| 6. Solar gains: | | | | | | | | | | | | |
| Solar gains are calculated | • | | | | • | itions to | | ne applica | | tion. | | |
| Orientation: Access F Table 6d | | Area m² | | Flu Ta | ıx ble 6a | | g_ Table 6b | Т | FF able 6c | | Gains (W) | |
| 0 11 1 | | | | | | , – | | | | _ | | 1(70) |
| 0 11 1 | X | 8.6 | | - | 36.79 | ¦ ⊨ | 0.63 | X | 0.7 | = | 97.28 | (79) |
| On with war at | X | 8.6 | | | 52.67 | j L | 0.63 | × | 0.7 | = | 165.7 | (79) |
| 0.11 | | 8.6 | | | 35.75 | , | 0.63 | × | 0.7 | _ = | 226.72 |](79)] ₍₇₀₎ |
| | | 8.6 | | - | 06.25 |] - | 0.63 | × | 0.7 | = | 280.91 | (79) |
| Southwest _{0.9x} 0.77 | X | 8.6 | 5 | x 1 | 19.01 | J L | 0.63 | X | 0.7 | = | 314.65 | (79) |

| | | | | | | | | | | | | | _ |
|---------------------------------|----------------|------------|------------|-----------|---------------|------------|--------------|-----------|-------------|-------------|--------------|--------|-------------|
| Southwest _{0.9} | × 0.77 | X | 8.6 | 5 | x 1 | 18.15 | | 0.63 | × | 0.7 | = | 312.37 | (79) |
| Southwest _{0.9} | × 0.77 | x | 8.6 | 55 | x 1 | 13.91 | | 0.63 | X | 0.7 | = | 301.16 | (79) |
| Southwest _{0.9} | x 0.77 | X | 8.6 | 55 | x 1 | 04.39 | | 0.63 | X | 0.7 | = | 275.99 | (79) |
| Southwest _{0.9} | × 0.77 | x | 8.6 | 55 | x g | 92.85 | | 0.63 | x | 0.7 | = | 245.49 | (79) |
| Southwest _{0.9} | × 0.77 | x | 8.6 | 55 | x (| 69.27 | | 0.63 | x | 0.7 | = | 183.13 | (79) |
| Southwest _{0.9} | × 0.77 | x | 8.6 | 55 | X | 44.07 | | 0.63 | x | 0.7 | = | 116.52 | (79) |
| Southwest _{0.9} | x 0.77 | x | 8.6 | 55 | x (| 31.49 | | 0.63 | x | 0.7 | = | 83.25 | (79) |
| | | | | | | | | | | | | | |
| Solar gains | in watts, ca | alculated | for eac | n month | _ | _ | (83)m = S | um(74)m . | (82)m | _ | | | |
| (83)m= 97.2 | 3 165.7 | 226.72 | 280.91 | 314.65 | 312.37 | 301.16 | 275.99 | 245.49 | 183.13 | 116.52 | 83.25 | | (83) |
| Total gains - | - internal a | and solar | (84)m = | (73)m | + (83)m | , watts | | | | | | | |
| (84)m= 489.4 | 2 555.65 | 604.18 | 638.49 | 652.3 | 630.75 | 606.99 | 587.81 | 567.53 | 525.27 | 481.65 | 465.36 | | (84) |
| 7. Mean int | ernal temp | perature | (heating | season |) | | | | | | | | |
| Temperatu | re during h | neating p | eriods ir | the livi | ng area | from Tal | ole 9, Th | 1 (°C) | | | | 21 | (85) |
| Utilisation f | actor for g | ains for I | iving are | ea, h1,m | (see Ta | able 9a) | | | | | | | |
| Jar | n Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (86)m= 0.94 | 0.92 | 0.88 | 0.81 | 0.7 | 0.55 | 0.42 | 0.45 | 0.63 | 0.82 | 0.92 | 0.95 | | (86) |
| Mean inter | nal temper | ature in | living are | ea T1 (fo | ollow ste | eps 3 to 7 | r in Tabl | e 9c) | • | • | | | |
| (87)m= 19.3 | | 19.92 | 20.33 | 20.67 | 20.89 | 20.96 | 20.96 | 20.82 | 20.4 | 19.79 | 19.27 | | (87) |
| Tomporotu | ro during h | L | oriodo ir | root of | dualling | from To | shlo O. T | h2 (°C) | | | | | |
| Temperatu (88)m= 20.14 | | 20.15 | 20.16 | 20.16 | 20.17 | 20.17 | 20.17 | 20.17 | 20.16 | 20.15 | 20.15 | | (88) |
| | | | | | | ļ | <u> </u> | 20.17 | 20.10 | 20.10 | 20.10 | | () |
| Utilisation f | | | | | · · | I | T | I 0.50 | 0.70 | 0.0 | 0.04 | | (90) |
| (89)m= 0.94 | 0.91 | 0.86 | 0.78 | 0.66 | 0.5 | 0.35 | 0.38 | 0.58 | 0.79 | 0.9 | 0.94 | | (89) |
| Mean inter | - ' | ature in | | | ` | 1 | eps 3 to | 1 | | | | | |
| (90)m= 17.8 | 3 18.24 | 18.75 | 19.33 | 19.78 | 20.06 | 20.15 | 20.14 | 19.99 | 19.43 | 18.58 | 17.82 | | (90) — |
| | | | | | | | | 1 | LA = Livin | g area ÷ (4 | 1) = | 0.43 | (91) |
| Mean inter | nal temper | ature (fo | r the wh | ole dwe | lling) = f | LA × T1 | + (1 – fL | A) × T2 | | | | | |
| (92)m= 18.5 | 18.81 | 19.25 | 19.77 | 20.17 | 20.42 | 20.5 | 20.49 | 20.35 | 19.85 | 19.11 | 18.44 | | (92) |
| Apply adjus | stment to t | he mean | internal | temper | ature fro | m Table | 4e, whe | ere appro | priate | | | | |
| (93)m= 18.5 | 18.81 | 19.25 | 19.77 | 20.17 | 20.42 | 20.5 | 20.49 | 20.35 | 19.85 | 19.11 | 18.44 | | (93) |
| 8. Space h | | | | | | | | | | | | | |
| Set Ti to th the utilisation | | | | | ned at st | ep 11 of | Table 9 | b, so tha | t Ti,m=(| 76)m an | d re-calc | ulate | |
| Jar | | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Utilisation f | | | • | iviay | Juli | 1 341 | Aug | Гоер | 001 | 1407 | Dec | | |
| (94)m= 0.92 | | 0.84 | 0.77 | 0.66 | 0.51 | 0.38 | 0.4 | 0.59 | 0.78 | 0.89 | 0.93 | | (94) |
| Useful gair | s, hmGm | , W = (94 | 1)m x (84 | 4)m | ļ | ! | | <u>!</u> | | | | | |
| (95)m= 449.3 | _ | 509.64 | 491.89 | 432.41 | 324.26 | 228.47 | 237.31 | 335.01 | 410.76 | 426.45 | 431.16 | | (95) |
| Monthly av | erage exte | ernal tem | perature | from T | able 8 | | ! | ! | | | | | |
| (96)m= 4.3 | 4.9 | 6.5 | 8.9 | 11.7 | 14.6 | 16.6 | 16.4 | 14.1 | 10.6 | 7.1 | 4.2 | | (96) |
| Heat loss r | ate for me | an intern | al tempe | erature, | Lm , W | =[(39)m | x [(93)m | – (96)m |] | | | | |
| (97)m= 895.0 | | 799.2 | 671.31 | 521.56 | 353.3 | 236.69 | 247.69 | 381.47 | 569.86 | 743.91 | 887.71 | | (97) |
| Space hea | | r | | | Wh/mon | th = 0.02 | 24 x [(97 |)m – (95 | | r – | | | |
| (98)m= 331.5 | 9 256.13 | 215.43 | 129.19 | 66.33 | 0 | 0 | 0 | 0 | 118.37 | 228.57 | 339.67 | | |

| | Total per year (kWh/year) = $Sum(98)_{15,912}$ = | 1685.27 | (98) |
|--|--|--------------------------|--------|
| Space heating requirement in kWh/m²/year | | 24.88 | (99) |
| 9b. Energy requirements – Community heating scheme | | | |
| This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab | | 0 | (301) |
| Fraction of space heat from community system 1 – (301) = | , | 1 | (302) |
| The community scheme may obtain heat from several sources. The procedure allow | vs for CHP and up to four other heat sources: t | | ` ′ |
| includes boilers, heat pumps, geothermal and waste heat from power stations. See | | no iditor | _ |
| Fraction of heat from Community boilers | | 1 | (303a) |
| Fraction of total space heat from Community boilers | (302) x (303a) = | 1 | (304a) |
| Factor for control and charging method (Table 4c(3)) for community | heating system | 1 | (305) |
| Distribution loss factor (Table 12c) for community heating system | | 1.05 | (306) |
| Space heating | | kWh/yea | r_ |
| Annual space heating requirement | | 1685.27 | ╛ |
| Space heat from Community boilers | (98) x (304a) x (305) x (306) = | 1769.53 | (307a) |
| Efficiency of secondary/supplementary heating system in % (from 7 | Table 4a or Appendix E) | 0 | (308 |
| Space heating requirement from secondary/supplementary system | (98) x (301) x 100 ÷ (308) = | 0 | (309) |
| Water heating Annual water heating requirement | | 2078.69 | 7 |
| If DHW from community scheme: Water heat from Community boilers | (64) x (303a) x (305) x (306) = | 2182.63 | (310a) |
| Electricity used for heat distribution | 0.01 × [(307a)(307e) + (310a)(310e)] = | 39.52 | (313) |
| Cooling System Energy Efficiency Ratio | | 0 | (314) |
| Space cooling (if there is a fixed cooling system, if not enter 0) | = (107) ÷ (314) = | 0 | (315) |
| Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out | side | 235.01 | (330a) |
| warm air heating system fans | | 0 | (330b) |
| pump for solar water heating | | 0 | (330g) |
| Total electricity for the above, kWh/year | =(330a) + (330b) + (330g) = | 235.01 | (331) |
| Energy for lighting (calculated in Appendix L) | =(000d) + (000d) + (000g) = | 330.87 | (332) |
| Electricity generated by PVs (Appendix M) (negative quantity) | | -683.38 | (333) |
| Electricity generated by VVs (Appendix M) (negative quantity) | itu) | | (334) |
| | пу) | 0 | (334) |
| 12b. CO2 Emissions – Community heating scheme | Energy Emission factor kWh/year kg CO2/kWh | Emissions kg CO2/year | |
| CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two | o fuels repeat (363) to (366) for the second fue | 94 | (367a) |
| CO2 associated with heat source 1 [(307b)+(310 | (b)] x 100 ÷ (367b) x 0.22 = | 908.16 | (367) |
| Electrical energy for heat distribution [(31: | 3) x 0.52 = | 20.51 | (372) |

| Total CO2 associated with community systems | (363)(366) + (368)(372) | | = [| 928.67 | (373) |
|--|--------------------------------|----------|-----|---------|-------|
| CO2 associated with space heating (secondary) | (309) x | 0 | = [| 0 | (374) |
| CO2 associated with water from immersion heater or | r instantaneous heater (312) x | 0.22 | = [| 0 | (375) |
| Total CO2 associated with space and water heating | (373) + (374) + (375) = | | | 928.67 | (376) |
| CO2 associated with electricity for pumps and fans w | vithin dwelling (331)) x | 0.52 | = [| 121.97 | (378) |
| CO2 associated with electricity for lighting | (332))) x | 0.52 | = [| 171.72 | (379) |
| Energy saving/generation technologies (333) to (334 Item 1 |) as applicable 0.52 | x 0.01 = | | -354.67 | (380) |
| Total CO2, kg/year sum of (376) | (382) = | | | 867.68 | (383) |
| Dwelling CO2 Emission Rate (383) ÷ (4) = | | | | 12.81 | (384) |
| El rating (section 14) | | | | 89.69 | (385) |

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 October 2020

Property Details: Plot 2

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: No **Number of storeys:** 1

Front of dwelling faces: North East

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

Night ventilation: False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach): 4 (Windows fully open)

Overheating Details:

Summer ventilation heat loss coefficient: 223.54 (P1)

Transmission heat loss coefficient: 48.1

Summer heat loss coefficient: 271.63 (P2)

Overhangs:

Orientation: Ratio: Z_overhangs:

South West (SW) 0 1

Solar shading:

Orientation:Z blinds:Solar access:Overhangs:Z summer:South West (SW)10.910.9

Solar gains:

Orientation FF Area Flux Shading Gains g_{-} 119.92 0.9 370.59 South West (SW) 0.9 x8.65 0.63 0.7 **Total** 370.59 (P3/P4)

Internal gains:

June July **August** 441.26 433.48 Internal gains 425.32 830.28 795.91 779.19 (P5) Total summer gains Summer gain/loss ratio 3.06 2.93 2.87 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Thermal mass temperature increment 1.3 1.3 1.3 (P7) Threshold temperature 20.36 22.13 21.97 Likelihood of high internal temperature Not significant Medium Slight

Assessment of likelihood of high internal temperature: Medium

| | | User_[| Details: | | | | | | | | | |
|---|--|-------------|---|--------------|-------------------|-----------|-------------|------------------------|--------------|--|--|--|
| Assessor Name: Software Name: | Zahid Ashraf Stroma FSAP 2012 | | Strom Softwa | | | | | 0001082 on: 1.0.5.9 | | | | |
| | | Property | Address | : Plot 2 | | | | | | | | |
| Address: 1 Overall dwelling dimensions: | | | | | | | | | | | | |
| 1. Overall dwelling dime | ensions: | | | | | | | | | | | |
| Ground floor | | | a(m²) | 1,, , | Av. He | - ' | _ | Volume(m ³ | <u>`</u> | | | |
| | | | 67.74 | (1a) x | | 2.5 | (2a) = | 169.35 | (3a) | | | |
| Total floor area TFA = (1 | a)+(1b)+(1c)+(1d)+(1e)+(1 | n) | 67.74 | (4) | | | | | | | | |
| Dwelling volume | | | | (3a)+(3b |)+(3c)+(3c | d)+(3e)+. | (3n) = | 169.35 | (5) | | | |
| 2. Ventilation rate: | | | | | | | | | | | | |
| | main seconda heating heating | ry | other | | total | | | m³ per hou | ır | | | |
| Number of chimneys | 0 + 0 | + | 0 | = [| 0 |) | < 40 = | 0 | (6a) | | | |
| Number of open flues | 0 + 0 | _ + [| 0 | Ī = [| 0 | , | (20 = | 0 | (6b) | | | |
| Number of intermittent fa | ins | | | _ | 2 | , | c 10 = | 20 | (7a) | | | |
| Number of passive vents | ; | | | | 0 | | < 10 = | 0 | (7b) | | | |
| Number of flueless gas fi | | | | L | 0 | | < 40 = | 0 | (7c) | | | |
| rvambor or naciooc gac n | | | | L | | | | 0 | (10) | | | |
| | | | | | | | Air ch | nanges per ho | our | | | |
| Infiltration due to chimne | ys, flues and fans = (6a)+(6b)+ | (7a)+(7b)+ | (7c) = | Γ | 20 | | ÷ (5) = | 0.12 | (8) | | | |
| | peen carried out or is intended, proce | ed to (17), | otherwise (| continue fi | rom (9) to | (16) | | | | | | |
| Number of storeys in the Additional infiltration | he dwelling (ns) | | | | | • (- | | 0 | (9) | | | |
| | .25 for steel or timber frame o | r 0 35 fc | r macon | ny coneti | ruction | [(9 | 9)-1]x0.1 = | 0 | (10) | | | |
| | resent, use the value corresponding | | | • | uction | | | 0 | (11) | | | |
| deducting areas of opening | | | | | | | | | _ | | | |
| · | floor, enter 0.2 (unsealed) or (|).1 (seal | ed), else | enter 0 | | | | 0 | (12) | | | |
| If no draught lobby, en | s and doors draught stripped | | | | | | | 0 | (13) | | | |
| Window infiltration | s and doors draught stripped | | 0.25 - [0.2 | 2 x (14) ÷ 1 | 100] = | | | 0 | (14) | | | |
| Infiltration rate | | | | | - 12) + (13) · | + (15) = | | 0 | (16) | | | |
| Air permeability value, | q50, expressed in cubic metr | es per h | our per s | quare m | etre of e | envelop | e area | 3 | (17) | | | |
| If based on air permeabil | lity value, then $(18) = [(17) \div 20] +$ | (8), otherv | vise (18) = | (16) | | | | 0.27 | (18) | | | |
| | es if a pressurisation test has been do | ne or a de | egree air pe | ermeability | is being u | sed | | | _ | | | |
| Number of sides sheltere Shelter factor | ed | | (20) = 1 - | [0.075 x (| 19)] = | | | 2 | (19) (20) | | | |
| Infiltration rate incorporat | ting shelter factor | | (21) = (18 | • | /,1 | | | 0.85 | (21) | | | |
| Infiltration rate modified f | • | | () (- | , (- / | | | | 0.23 | (21) | | | |
| Jan Feb | Mar Apr May Jun | Jul | Aug | Sep | Oct | Nov | Dec |] | | | | |
| Monthly average wind sp | 1 , 1 , 1 | 1 | <u>, </u> | | | 1 | L | J | | | | |
| (22)m= 5.1 5 | 4.9 4.4 4.3 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 |] | | | | |
| | 2) | 1 | 1 | • | • | • | 1 | ı | | | | |
| Wind Factor (22a)m = $(2.2a)$ m = $(2.2a)$ | | 0.05 | 1 0.00 | | 1 4 00 | 4.40 | 140 | 1 | | | | |
| (22a)m= 1.27 1.25 | 1.23 1.1 1.08 0.95 | 0.95 | 0.92 | 1 | 1.08 | 1.12 | 1.18 | J | | | | |

| Adjusted infiltr | ation rat | e (allowi | ng for sl | nelter an | d wind s | peed) = | (21a) x | (22a)m | | | | | |
|--------------------------------------|--------------|----------------|-------------|----------------|-------------|---------------|--------------|-----------------|-------------|-------------|-----------|-----------------|-------|
| 0.29 | 0.28 | 0.28 | 0.25 | 0.24 | 0.22 | 0.22 | 0.21 | 0.23 | 0.24 | 0.26 | 0.27 | | |
| Calculate effe If mechanic | | _ | rate for t | пе арри | саріе са | se | | | | | | 0 | (2 |
| If exhaust air h | | | endix N, (2 | 3b) = (23a | a) × Fmv (e | equation (I | N5)) , othe | rwise (23b |) = (23a) | | | 0 | (2 |
| If balanced with | n heat reco | overy: effic | iency in % | allowing f | or in-use f | actor (fron | n Table 4h |) = | , , , | | | 0 | (2 |
| a) If balance | | - | - | _ | | | | | 2h)m + (| 23h) 🗴 [| 1 – (23c) | | (2 |
| 24a)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (2 |
| b) If balance | ed mech | L anical ve | ntilation | without | heat rec | covery (N | MV) (24b |)m = (2) | 2b)m + (| 23b) | | J | |
| 24b)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | (2 |
| c) If whole h | L OUSE EX | tract ver | tilation o | r positiv | e input v | ventilatio | on from c | LLLL outside | | | | J | |
| • | | | | • | • | | c) = (22k) | | .5 × (23b | o) | | | |
| 24c)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (2 |
| d) If natural | ventilatio | on or wh | ole hous | e positiv | e input | ventilatio | on from I | oft | | ! | | • | |
| if (22b)r | n = 1, th | en (24d) | m = (22l | o)m othe | rwise (2 | 4d)m = | 0.5 + [(2 | 2b)m² x | 0.5] | | | | |
| 24d)m= 0.54 | 0.54 | 0.54 | 0.53 | 0.53 | 0.52 | 0.52 | 0.52 | 0.53 | 0.53 | 0.53 | 0.54 | | (2 |
| Effective air | change | rate - er | iter (24a |) or (24b | o) or (24 | c) or (24 | d) in box | (25) | | , | , | | |
| 25)m= 0.54 | 0.54 | 0.54 | 0.53 | 0.53 | 0.52 | 0.52 | 0.52 | 0.53 | 0.53 | 0.53 | 0.54 | | (2 |
| 3. Heat losse | s and he | eat loss p | paramet | er: | | | | | | | | | |
| LEMENT | Gros | SS | Openin | gs | Net Ar | | U-valu | | AXU | | k-value | | A X k |
| 0010 | area | (m²) | m |) * | A ,r | 1 | W/m2 | _ | (W/ | K) | kJ/m²-l | K. | kJ/K |
| oors | | | | | 2 | × | 1.4 | = | 2.8 | _ | | | (2 |
| Vindows | | | | | 8.651 | x1 | /[1/(1.4)+ | 0.04] = | 11.47 | ᆗ , | | | (2 |
| loor | | | | | 67.73 | 9 x | 0.12 | = | 8.12867 | 9 | | _ | (2 |
| Valls Type1 | 50.9 | 9 | 8.65 | | 42.34 | X | 0.15 | = | 6.35 | | | ᆜ | (2 |
| Valls Type2 | 21.2 | 26 | 2 | | 19.26 | X | 0.14 | = | 2.76 | | | | (2 |
| Valls Type3 | 18.0 |)2 | 0 | | 18.02 | <u>x</u> | 0.13 | = | 2.41 | | | | (2 |
| Roof Type1 | 5.7 | , | 0 | | 5.7 | X | 0.1 | = | 0.57 | | | | (3 |
| Roof Type2 | 4.1 | 2 | 0 | | 4.12 | X | 0.1 | = | 0.41 | | | | (3 |
| otal area of e | elements | , m² | | | 167.8 | 2 | | | | | | | (3 |
| for windows and | | | | | | ated using | g formula 1 | /[(1/U-valu | ıe)+0.04] a | as given in | paragraph | 1 3.2 | |
| * include the area | | | | ls and par | titions | | (22) (22) | (22) | | | | | |
| abric heat los | | • | U) | | | | (26)(30) | | | | | 34.9 | (3 |
| leat capacity | | , | _ | | | | | | (30) + (32 | , , , | (32e) = | 8654.27 | (3 |
| hermal mass | • | • | | , | | | | | tive Value | | | 100 | (3 |
| or design asses: an be used inste | | | | construct | ion are not | t known pi | recisely the | : indicative | e values of | 'IMP IN I | able 1f | | |
| hermal bridg | | | | using Ap | pendix ł | < | | | | | | 13.2 | (3 |
| details of therma | , | , | | | • | | | | | | | | ` |
| otal fabric he | at loss | | | | | | | (33) + | (36) = | | | 48.09 | (3 |
| entilation hea | at loss ca | alculated | l monthly | y | | | | (38)m | = 0.33 × (| (25)m x (5 |) | | _ |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| 8)m= 30.3 | 30.21 | 30.12 | 29.7 | 29.62 | 29.25 | 29.25 | 29.18 | 29.39 | 29.62 | 29.78 | 29.95 | | (3 |
| leat transfer | coefficie | nt, W/K | | | | | | (39)m | = (37) + (| 38)m | | | |
| 39)m= 78.4 | 78.3 | 78.21 | 77.79 | 77.71 | 77.35 | 77.35 | 77.28 | 77.49 | 77.71 | 77.87 | 78.04 |] | |
| | | | A D 0 00\ | http://www | w.stroma.d | | • | | Average = | Sum(39) | 12 /12= | 77.7 ⊝ a | - C |

| at loss para | meter (H | HLP), W/ | m²K | | | | | (40)m | = (39)m ÷ | - (4) | | | |
|---|-------------|-------------|--------------|-------------|-------------|------------|--------------|-----------------------|-------------|------------------------|--|---------|----|
| m= 1.16 | 1.16 | 1.15 | 1.15 | 1.15 | 1.14 | 1.14 | 1.14 | 1.14 | 1.15 | 1.15 | 1.15 | | |
| mber of day | e in moi | oth (Tah | la 1a) | | • | | | , | Average = | Sum(40) ₁ . | 12 /12= | 1.15 | (4 |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| m= 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | | (4 |
| | | | | | | | | | | | | | |
| Water heat | ing ener | gy requi | rement: | | | | | | | | kWh/ye | ar: | |
| sumed occu TFA > 13.9 TFA £ 13.9 | N = 1 | | [1 - exp | (-0.0003 | 349 x (TF | FA -13.9) |)2)] + 0.0 | 0013 x (⁻ | ΓFA -13. | | 19 | | (4 |
| nual averago Juce the annua more that 125 | l average | hot water | usage by | 5% if the a | lwelling is | designed t | | | se target o | | .75 | | (4 |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| water usage in | litres per | day for ea | ach month | Vd,m = fa | ctor from | able 1c x | (43) | | | • | | | |
| m= 99.83 | 96.2 | 92.57 | 88.94 | 85.31 | 81.68 | 81.68 | 85.31 | 88.94 | 92.57 | 96.2 | 99.83 | | |
| rgy content of | hot water | used - cal | culated ma | onthly – 4 | 190 v Vd r | n v nm v F | Tm / 3600 | | | m(44) ₁₁₂ = | | 1089 | (|
| | 129.47 | 133.61 | 116.48 | 111.77 | 96.45 | 89.37 | 102.56 | 103.78 | 120.95 | 132.02 | 143.37 | | |
| m= 148.04 | 129.47 | 133.01 | 110.40 | 111.77 | 90.45 | 09.37 | 102.30 | | | m(45) ₁₁₂ = | | 1427.85 | (|
| stantaneous w | ater heatii | ng at point | of use (no | hot water | storage), | enter 0 in | boxes (46) | | rotar = Su | 111(43)112 = | L | 1427.03 | |
| m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (|
| ter storage | | | | | | | | | | | | | |
| rage volum | , , | | • | | | _ | | ame ves | sel | | 0 | | (|
| ommunity herwise if no | _ | | | _ | | | | ora) onto | or 'O' in / | ′ 47 \ | | | |
| ter storage | | noi wate | : (11115 111 | ciudes i | HStaritar | ieous co | יווטט וטוווי | ers) erite | 51 U III (| (47) | | | |
| If manufacti | | eclared l | oss facto | or is kno | wn (kWh | n/day): | | | | | 0 | | (|
| nperature fa | actor fro | m Table | 2b | | | | | | | | 0 | | (|
| ergy lost fro | m water | storage | , kWh/ye | ear | | | (48) x (49) |) = | | | 0 | | (|
| If manufacti | | | - | | | | | | | | | | |
| t water stora ommunity h | - | | | e ∠ (KVV | n/litre/da | ıy) | | | | | 0 | | (|
| ume factor | • | | JII 4.5 | | | | | | | | 0 | | (|
| nperature fa | actor fro | m Table | 2b | | | | | | | | 0 | | (|
| ergy lost fro | m water | storage | , kWh/ye | ear | | | (47) x (51) | x (52) x (| 53) = | | 0 | | (|
| ter (50) or (| | _ | • | | | | | | | | 0 | | (|
| ter storage | loss cal | culated f | or each | month | | | ((56)m = (| 55) × (41) | m | | | | |
| m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (|
| linder contains | dedicate | d solar sto | rage, (57)r | m = (56)m | x [(50) – (| H11)] ÷ (5 | 0), else (5 | 7)m = (56) | m where (| H11) is fro | m Appendix | κН | |
| m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (|
| mary circuit | loss (an | nual) fro | m Table | 3 | | | | | | | 0 | | (|
| - | • | • | | | | | | | | | | | |
| mary circuit | ioss cai | culated t | or each | month (| 59)m = (| (58) ÷ 36 | 65 × (41) | m | | | | | |
| mary circuit modified by | | | | , | • | . , | , , | | r thermo | stat) | | | |

| Combi loss ca | alculated | for each | month (| ′61)m = | (60) ± 3 | 65 v (41 |)m | | | | | | |
|---------------------------|----------------------|------------|-------------|------------|-----------|-----------------|------------|----------------|-------------|---------------|-------------|-----------------|------|
| (61)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | (61) |
| | uired for | water h | eating ca | alculated | l for eac | h month | (62)m | = 0.85 × | (45)m + | (46)m + | (57)m + | - (59)m + (61)m | |
| (62)m= 125.83 | ` | 113.57 | 99.01 | 95 | 81.98 | 75.97 | 87.17 | | 102.8 | 112.22 | 121.86 |] | (62) |
| Solar DHW input | : calculated | using App | endix G oı | · Appendix | H (negat | ive quantity | y) (entei | '0' if no sola | r contribu | tion to wate | er heating) |) L | |
| (add additiona | | | | | | | | | | | | | |
| (63)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (63) |
| Output from v | vater hea | ter | | | | • | • | • | • | • | • | - | |
| (64)m= 125.83 | 110.05 | 113.57 | 99.01 | 95 | 81.98 | 75.97 | 87.17 | 88.21 | 102.8 | 112.22 | 121.86 |] | |
| | • | | | • | • | • | 0 | utput from w | ater heate | er (annual) | 112 | 1213.68 | (64) |
| Heat gains fro | om water | heating, | kWh/m | onth 0.2 | 5 ´ [0.85 | 5 × (45)m | ı + (61 |)m] + 0.8 | k [(46)m | + (57)m | + (59)m | ı] | |
| (65)m= 31.46 | 27.51 | 28.39 | 24.75 | 23.75 | 20.49 | 18.99 | 21.79 | 22.05 | 25.7 | 28.05 | 30.47 |] | (65) |
| include (57 |)m in cald | culation (| of (65)m | only if c | ylinder | is in the | dwellir | g or hot w | ater is f | rom com | munity h | neating | |
| 5. Internal g | jains (see | e Table 5 | and 5a |): | | | | | | | | | |
| Metabolic gai | ns (Table | e 5), Wat | ts | | | | | | | | | | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | g Sep | Oct | Nov | Dec |] | |
| (66)m= 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 |] | (66) |
| Lighting gains | s (calcula | ted in Ap | pendix | L, equat | ion L9 c | or L9a), a | lso se | e Table 5 | | | | - | |
| (67)m= 18.74 | 16.64 | 13.53 | 10.25 | 7.66 | 6.47 | 6.99 | 9.08 | 12.19 | 15.48 | 18.06 | 19.26 |] | (67) |
| Appliances ga | ains (calc | ulated ir | Append | dix L, eq | uation L | .13 or L1 | 3a), al | so see Ta | ble 5 | | | - | |
| (68)m= 191.96 | 193.96 | 188.94 | 178.25 | 164.76 | 152.08 | 143.61 | 141.6 | 2 146.64 | 157.33 | 170.82 | 183.49 |] | (68) |
| Cooking gain | s (calcula | ted in A | ppendix | L, equat | ion L15 | or L15a |), also | see Table | 5 | • | | - | |
| (69)m= 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 |] | (69) |
| Pumps and fa | ans gains | (Table 5 | ōa) | | | | | • | | | | - | |
| (70)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (70) |
| Losses e.g. e | vaporatio | n (nega | tive valu | es) (Tab | le 5) | | • | • | | | | - | |
| (71)m= -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 |] | (71) |
| Water heating | g gains (T | able 5) | | | | | | - | • | | | - | |
| (72)m= 42.28 | 40.94 | 38.16 | 34.38 | 31.92 | 28.46 | 25.53 | 29.29 | 30.63 | 34.54 | 38.96 | 40.95 |] | (72) |
| Total interna | l gains = | | | | (66 | 5)m + (67)m | า + (68)เ | n + (69)m + | (70)m + (7 | 71)m + (72) |)m | - | |
| (73)m= 308.83 | 307.39 | 296.48 | 278.72 | 260.19 | 242.86 | 231.97 | 235.8 | 4 245.31 | 263.2 | 283.69 | 299.55 |] | (73) |
| 6. Solar gair | ns: | | | | | | | | | | | | |
| Solar gains are | calculated | using sola | r flux from | Table 6a | and asso | ciated equa | ations to | convert to th | ne applical | | tion. | | |
| Orientation: | Access F Table 6d | | Area m² | | Flu | ux ible 6a | | g_ Table 6b | т | FF able 6c | | Gains | |
| | | | | | | ible ba | | Table ob | _ ' | able oc | | (W) | , |
| Southwest _{0.9x} | | X | 8.6 | 35 | X | 36.79 | <u> </u> | 0.63 | x | 0.7 | = | 97.28 | (79) |
| Southwest _{0.9x} | • | X | 8.6 | S5 | X | 62.67 | ļ <u>Ļ</u> | 0.63 | × | 0.7 | = | 165.7 | (79) |
| Southwest _{0.9x} | | X | 8.6 | S5 | x | 85.75 | ļ Ļ | 0.63 | x | 0.7 | = | 226.72 | (79) |
| Southwest _{0.9x} | | X | 8.6 | S5 | x | 106.25 | ļĹ | 0.63 | x | 0.7 | = | 280.91 | (79) |
| Southwest _{0.9x} | 0.77 | X | 8.6 | 35 | X | 119.01 | | 0.63 | X | 0.7 | = | 314.65 | (79) |

| Southwest _{0.9x} 0.77 | X | 8.6 | 55 | x | 118.15 | | 0.63 | х | 0.7 | = | 312.37 | (79) |
|---|----------------------|--|---------------|---------------|---------------|--------------|--------------------|--------------|-------------|-----------|--------|-------|
| Southwest _{0.9x} 0.77 | x | 8.6 | 55 | x | 113.91 | | 0.63 | x | 0.7 | = | 301.16 | (79) |
| Southwest _{0.9x} 0.77 | х | 8.6 | 55 | x | 104.39 | | 0.63 | x | 0.7 | = | 275.99 | (79) |
| Southwest _{0.9x} 0.77 | х | 8.6 | 55 | x | 92.85 | | 0.63 | x | 0.7 | = | 245.49 | (79) |
| Southwest _{0.9x} 0.77 | х | 8.6 | 55 | x | 69.27 | | 0.63 | x | 0.7 | = | 183.13 | (79) |
| Southwest _{0.9x} 0.77 | x | 8.6 | 55 | x | 44.07 | Ī | 0.63 | x | 0.7 | | 116.52 | (79) |
| Southwest _{0.9x} 0.77 | x | 8.6 | 55 | х | 31.49 | ĪĪ | 0.63 | x | 0.7 | | 83.25 | (79) |
| | | | | _ | | | | | | | | |
| Solar gains in watts, c | alculated | for eacl | n month | | | (83)m | = Sum(74)m | (82)m | | | • | |
| (83)m= 97.28 165.7 | 226.72 | 280.91 | 314.65 | | 2.37 301.16 | 275. | 99 245.49 | 183.13 | 116.52 | 83.25 | | (83) |
| Total gains – internal a | | ` | , , | Ò | | | | - | 1 | | 1 | |
| (84)m= 406.11 473.09 | 523.2 | 559.64 | 574.84 | 55 | 55.23 533.13 | 511. | 84 490.79 | 446.33 | 400.21 | 382.8 | | (84) |
| 7. Mean internal temp | perature | (heating | season |) | | | | | | | | |
| Temperature during I | neating p | eriods ir | the livi | ng a | area from Ta | able 9, | Th1 (°C) | | | | 21 | (85) |
| Utilisation factor for g | ains for I | iving are | ea, h1,m | (se | ee Table 9a) | | | | _ | | 1 | _ |
| Jan Feb | Mar | Apr | May | _ | Jun Jul | Αι | ıg Sep | Oct | Nov | Dec | | |
| (86)m= 0.97 0.95 | 0.92 | 0.88 | 0.8 | 0 | .68 0.55 | 0.58 | 0.75 | 0.89 | 0.95 | 0.97 | | (86) |
| Mean internal temper | rature in I | iving are | ea T1 (fo | ollov | w steps 3 to | 7 in Ta | able 9c) | | | | | |
| (87)m= 18.59 18.86 | 19.29 | 19.81 | 20.31 | 20 | 0.69 20.88 | 20.8 | 5 20.56 | 19.92 | 19.15 | 18.52 | | (87) |
| Temperature during I | neating p | eriods ir | rest of | dwe | elling from T | able 9 | , Th2 (°C) | - | - | - | • | |
| (88)m= 19.95 19.96 | 19.96 | 19.96 | 19.96 | 1 | 9.97 19.97 | 19.9 | | 19.96 | 19.96 | 19.96 | | (88) |
| Utilisation factor for g | iains for r | est of d | welling | h2 r | m (see Table | - 9a) | | - ! | • | | | |
| (89)m= 0.96 0.94 | 0.91 | 0.86 | 0.76 | Г | .61 0.45 | 0.48 | 3 0.7 | 0.87 | 0.94 | 0.97 | | (89) |
| Mean internal temper | roturo in t | ho root | of dwall | ina. | T2 (follow et | one 2 | to 7 in Tol | -lo ()o) | Į. | | | |
| (90)m= 17.75 18.03 | 18.44 | 18.95 | 19.42 | Ť | 9.77 19.91 | 19.8 | | 19.07 | 18.31 | 17.69 | | (90) |
| (66) | 1 | .0.00 | | | 1 10.01 | 1 | 1 | | ng area ÷ (| | 0.43 | (91) |
| Managiatawaltawa | | 41 | -ll | II: | \ | | 41 A) To | 2 | | | | ` ′ |
| Mean internal temper (92)m= 18.11 18.39 | 18.81 | 19.32 | 19.8 | T T | 0.17 20.33 | 20.3 | | 19.43 | 18.67 | 18.05 | | (92) |
| Apply adjustment to t | | | | Ь | | | | | 10.07 | 10.03 | | (02) |
| (93)m= 18.11 18.39 | 18.81 | 19.32 | 19.8 | 1 | 0.17 20.33 | 20.3 | | 19.43 | 18.67 | 18.05 | | (93) |
| 8. Space heating req | uirement | | | | | | | | | | | |
| Set Ti to the mean in | ternal ten | nperatur | e obtair | ned | at step 11 o | f Table | 9b, so th | at Ti,m= | (76)m an | d re-calc | culate | |
| the utilisation factor f | or gains u | using Ta | ble 9a | _ | | | | | | | Ī | |
| Jan Feb | Mar | Apr | May | _ | Jun Jul | Αι | ig Sep | Oct | Nov | Dec | | |
| Utilisation factor for g | | | | | | 1 | | 1 | 1 | | Ī | (0.4) |
| (94)m= 0.95 0.93 | 0.89 | 0.84 | 0.76 | 0 | .63 0.49 | 0.52 | 2 0.7 | 0.86 | 0.93 | 0.96 | | (94) |
| Useful gains, hmGm (95)m= 385.7 438.88 | , VV = (94) 468.25 | 470.48 | 4)m 434.28 | 24 | 8.09 258.59 | 265 | 48 344.01 | 382.12 | 371.99 | 265.90 | | (95) |
| (95)m= 385.7 438.88 Monthly average exte | | | | | | 265. | 46 344.01 | 302.12 | 371.99 | 365.89 | | (90) |
| (96)m= 4.3 4.9 | 6.5 | 8.9 | 11.7 | $\overline{}$ | 4.6 16.6 | 16.4 | 1 14.1 | 10.6 | 7.1 | 4.2 | | (96) |
| Heat loss rate for me | 1 1 | | | <u> </u> | | | | | 1 | I | 1 | . , |
| (97)m= 1082.92 1056.13 | | 810.93 | 629.83 | 1 | 0.54 288.16 | | , , , , | - | 901.36 | 1080.97 | | (97) |
| Space heating requir | ement fo | r each m | nonth, k | Wh/ | month = 0.0 | 24 x [(| 97)m – (9 | 5)m] x (4 | 11)m | I | 1 | |
| (98)m= 518.73 414.8 | 367.68 | 245.12 | 145.49 | | 0 0 | 0 | 0 | 226.48 | 381.15 | 532.01 | | |
| - | | | | | | | | | | | - | |

| | | | | | | | | Tota | l per year | (kWh/yeaı | r) = Sum(9 | 8) _{15,912} = | 2831.46 | (98) |
|------------------|----------|------------------------|------------|-----------|--------------------|-----------|-----------|-------------|------------|-----------|------------|------------------------|---------|-------|
| Space | heatin | g require | ement in | kWh/m² | ² /year | | | | | | | | 41.8 | (99) |
| 8c. Sp | ace co | oling req | uiremer | nt | | | | | | | | | | |
| Calcul | ated fo | r June, J | July and | August. | See Tal | ole 10b | | | | | _ | _ | _ | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Heat I | oss rate | e Lm (ca | lculated | using 2 | 5°C inter | nal temp | erature | and exte | ernal ten | nperatur | e from T | able 10) | | |
| (100)m= | 0 | 0 | 0 | 0 | 0 | 727.06 | 572.37 | 587.32 | 0 | 0 | 0 | 0 | | (100) |
| Utilisa | tion fac | tor for lo | ss hm | | | | | | | | | | | |
| (101)m= | 0 | 0 | 0 | 0 | 0 | 0.73 | 0.79 | 0.77 | 0 | 0 | 0 | 0 | | (101) |
| Useful | loss, h | mLm (V | /atts) = (| (100)m x | (101)m | - | | | | | | | • | |
| (102)m= | 0 | 0 | 0 | 0 | 0 | 527.68 | 454.32 | 455.03 | 0 | 0 | 0 | 0 | | (102) |
| Gains | (solar | gains cal | lculated | for appli | cable we | eather re | gion, se | e Table | 10) | | | | • | |
| (103)m= | 0 | 0 | 0 | 0 | 0 | 730.86 | 703.47 | 680.09 | 0 | 0 | 0 | 0 | | (103) |
| | | g require zero if (| | | | lwelling, | continu | ous (kW | h' = 0.02 | 24 x [(10 | 03)m – (| 102)m] . | x (41)m | |
| (104)m= | 0 | 0 | 0 | 0 | 0 | 146.28 | 185.37 | 167.44 | 0 | 0 | 0 | 0 | | |
| _ | | • | | | | | | | Total | = Sum(| 104) | = | 499.1 | (104) |
| Cooled | fraction | n | | | | | | | f C = | cooled | area ÷ (4 | 4) = | 1 | (105) |
| Intermi <u>t</u> | tency f | actor (Ta | able 10b |) | | | | | | | | | • | |
| (106)m= | 0 | 0 | 0 | 0 | 0 | 0.25 | 0.25 | 0.25 | 0 | 0 | 0 | 0 | | |
| | | | | | | | | | Total | I = Sum(| 104) | = | 0 | (106) |
| Space <u>c</u> | cooling | requirer | nent for | month = | (104)m | × (105) | × (106)r | n | | | | | • | |
| (107)m= | 0 | 0 | 0 | 0 | 0 | 36.57 | 46.34 | 41.86 | 0 | 0 | 0 | 0 | | |
| | | | | | | | | | Total | = Sum(| 107) | = | 124.77 | (107) |
| Space o | cooling | requirer | ment in k | «Wh/m²/y | /ear | | | | (107) | ÷ (4) = | | | 1.84 | (108) |
| 8f. Fabr | ric Ene | rgy Effici | ency (ca | alculated | only un | der spec | cial cond | litions, se | ee sectio | on 11) | | | | |
| Fabric | Energ | y Efficier | псу | | | | | | (99) - | + (108) = | = | | 43.64 | (109) |

SAP Input

Property Details: Plot 2

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 08 July 2020
Date of certificate: 28 October 2020

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

Water use <= 125 litres/person/day: False

PCDF Version: 466

Property description:

Dwelling type:

Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 67.739 m² 2.5 m

Living area: 29.219 m² (fraction 0.431)

Front of dwelling faces: North East

Opening types:

Name: Source: Type: Glazing: Argon: Frame:

NE Manufacturer Solid

SW Manufacturer Windows double-glazed Yes

Name: Gap: Frame Factor: g-value: **U-value:** Area: No. of Openings: NE mm 0 0 1.4 2 SW 0.7 0.63 1.4 8.651 16mm or more

Name: Type-Name: Location: Orient: Width: Height: NE Corridor Wall North East 0 0

NECorridor WallNorth East00SWExternal WallSouth West00

Overshading: Average or unknown

Opaque Elements:

| Type: | Gross area: | Openings: | Net area: | U-value: | Ru value: | Curtain wall: | Kappa: |
|------------------|-------------|-----------|-----------|----------|-----------|---------------|--------|
| External Elemen | <u>ts</u> | | | | | | |
| External Wall | 50.988 | 8.65 | 42.34 | 0.15 | 0 | False | N/A |
| Corridor Wall | 21.261 | 2 | 19.26 | 0.15 | 0.31 | False | N/A |
| Stairwell Wall | 18.017 | 0 | 18.02 | 0.15 | 0.82 | False | N/A |
| Flat Roof | 5.701 | 0 | 5.7 | 0.1 | 0 | | N/A |
| Corridor Ceiling | 4.118 | 0 | 4.12 | 0.1 | 0 | | N/A |
| Ground Floor | 67.739 | | | 0.12 | | | N/A |

Internal Elements
Party Elements

Thormal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0786

Length Psi-value

4.795 0.291 E2 Other lintels (including other steel lintels)

SAP Input

| | 13.2 | 0.048 | E4 | Jamb |
|------------|--------|--------|-----|--|
| | 31.989 | 0.144 | E5 | Ground floor (normal) |
| | 21.272 | 0.063 | E7 | Party floor between dwellings (in blocks of flats) |
| | 3.62 | 0.12 | E24 | Eaves (insulation at ceiling level - inverted) |
| | 5.195 | 0.56 | E15 | Flat roof with parapet |
| | 11.8 | 0.083 | E16 | Corner (normal) |
| | 1.575 | 0.059 | E14 | Flat roof |
| | 5.9 | -0.081 | E17 | Corner (inverted internal area greater than external area) |
| [Approved] | 2.95 | 0.06 | E18 | Party wall between dwellings |
| | 2.95 | 0.096 | E25 | Staggered party wall between dwellings |
| | 5.147 | 0.16 | P1 | Ground floor |
| | 3.391 | 0 | P3 | Intermediate floor between dwellings (in blocks of flats) |

Ventilation.

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 94 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later Design flow temperature: Unknown

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and at least two room

thermostats

Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

Water code: 901

Fuel :heat from boilers - mains gas

No hot water cylinder Solar panel: False

Others:

Electricity tariff: Standard Tariff
In Smoke Control Area: Unknown
Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: <u>Photovoltaic 1</u>

Installed Peak power: 0.83

SAP Input

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

| | | User_l | Details: | | | | | | |
|---|--|-------------|-----------------|--------------|------------|----------|-------------|------------------------|--------------|
| Assessor Name: Software Name: | Zahid Ashraf Stroma FSAP 2012 | | Strom Softwa | | | | | 0001082 on: 1.0.5.9 | |
| | | Property | Address | : Plot 2 | | | | | |
| Address : | | | | | | | | | |
| 1. Overall dwelling dime | ensions: | _ | | | | | | | |
| Ground floor | | _ | ea(m²) | l(10) v | Av. He | | _ | Volume(m ³ | <u>`</u> |
| | | | 67.74 | (1a) x | | 2.5 | (2a) = | 169.35 | (3a) |
| Total floor area TFA = (1 | a)+(1b)+(1c)+(1d)+(1e)+(1 | n) | 67.74 | (4) | | | | | |
| Dwelling volume | | | | (3a)+(3b |)+(3c)+(3c | d)+(3e)+ | (3n) = | 169.35 | (5) |
| 2. Ventilation rate: | · | | 41 | | | | | 2 | |
| | main seconda heating heating | | other | | total | | | m³ per hou | ır |
| Number of chimneys | 0 + 0 | + [| 0 |] = [| 0 |) | 40 = | 0 | (6a) |
| Number of open flues | 0 + 0 | + | 0 |] = [| 0 |) | 20 = | 0 | (6b) |
| Number of intermittent fa | ins | | | | 2 |) | 10 = | 20 | (7a) |
| Number of passive vents | ; | | | Ī | 0 | , | 10 = | 0 | (7b) |
| Number of flueless gas fi | ires | | | Ĺ | 0 | | 40 = | 0 | (7c) |
| ŭ | | | | L | | | | _ | ` |
| | | | | | | | Air ch | nanges per ho | our |
| Infiltration due to chimne | ys, flues and fans = $(6a)+(6b)+$ | (7a)+(7b)+ | (7c) = | | 20 | | ÷ (5) = | 0.12 | (8) |
| | peen carried out or is intended, proce | ed to (17), | otherwise (| continue fi | rom (9) to | (16) | | | _ |
| Number of storeys in the Additional infiltration | ne aweiling (ns) | | | | | 1/0 | 9)-1]x0.1 = | 0 | (9) (10) |
| | .25 for steel or timber frame of | or 0.35 fo | r mason | rv consti | ruction | I(s |)-1]XO.1 = | 0 | (11) |
| | resent, use the value corresponding | | | • | | | | | (/ |
| deducting areas of openii | |) 1 /oool | مما المم | t O | | | | | 7 |
| If no draught lobby, en | floor, enter 0.2 (unsealed) or the 0.05, else enter 0.05 | J. i (Seai | ea), eise | enter 0 | | | | 0 | (12) |
| • | s and doors draught stripped | | | | | | | 0 | (14) |
| Window infiltration | o ama accio araagini carippoa | | 0.25 - [0.2 | 2 x (14) ÷ 1 | 100] = | | | 0 | (15) |
| Infiltration rate | | | (8) + (10) | + (11) + (| 12) + (13) | + (15) = | | 0 | (16) |
| Air permeability value, | q50, expressed in cubic metr | es per h | our per s | quare m | etre of e | envelop | e area | 5 | (17) |
| · | lity value, then $(18) = [(17) \div 20] +$ | | | | | | | 0.37 | (18) |
| Air permeability value applie Number of sides sheltere | es if a pressurisation test has been do | one or a de | egree air pe | rmeability | is being u | sed | | | 7(10) |
| Shelter factor | tu . | | (20) = 1 - | [0.075 x (| 19)] = | | | 0.85 | (19) (20) |
| Infiltration rate incorporat | ting shelter factor | | (21) = (18 | s) x (20) = | | | | 0.31 | (21) |
| Infiltration rate modified f | or monthly wind speed | | | | | | | | |
| Jan Feb | Mar Apr May Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly average wind sp | peed 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 | | |
| Wind Easter (22a)m = (2 | 2)m : 4 | | | | | | | | |
| Wind Factor $(22a)m = (22a)m = 1.27$ 1.25 | 2)m ÷ 4 1.23 | 0.95 | 0.92 | 1 1 | 1.08 | 1.12 | 1.18 | 1 | |
| (220)1117 1.21 1.20 | 1.20 1.11 1.00 0.95 | 1 0.00 | 1 0.02 | | 1 | 112 | 10 | J | |

| djusted infiltr | ation rat | e (allowi | ng for sh | nelter an | d wind s | peed) = | (21a) x | (22a)m | | , | _ | • | |
|---|--------------|--------------|-------------|-------------|----------------|-------------|------------------------|-------------|--------------|-------------|--------------------|---------------|---------------------------------------|
| 0.4 | 0.39 | 0.38 | 0.34 | 0.34 | 0.3 | 0.3 | 0.29 | 0.31 | 0.34 | 0.35 | 0.37 | | |
| <i>alculate effe</i> If mechanica | | • | rate for t | пе арри | саріе са | se | | | | | | 0 | |
| If exhaust air h | | | endix N, (2 | 3b) = (23a | ı) × Fmv (e | equation (I | N5)) , othe | rwise (23b |) = (23a) | | | 0 | (|
| If balanced with | n heat reco | overy: effic | iency in % | allowing f | or in-use f | actor (fron | n Table 4h |) = | | | | 0 | · · · · · · · · · · · · · · · · · · · |
| a) If balance | ed mecha | anical ve | entilation | with hea | at recove | ery (MVI | HR) (24a | ı)m = (2: | 2b)m + (| 23b) × [| 1 – (23c) | ÷ 100] | , |
| 4a)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (|
| b) If balance | ed mech | anical ve | ntilation | without | heat red | overy (I | MV) (24b |)m = (22 | 2b)m + (| 23b) | | - | |
| 4b)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (|
| c) If whole h | | | | | • | | on from (c) = (22b | | .5 × (23k | o) | | | |
| 1c)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| d) If natural if (22b)r | | | | • | | | on from I 0.5 + [(2 | | 0.5] | | | • | |
| 4d)m= 0.58 | 0.58 | 0.57 | 0.56 | 0.56 | 0.54 | 0.54 | 0.54 | 0.55 | 0.56 | 0.56 | 0.57 | | (|
| Effective air | change | rate - er | iter (24a |) or (24b | o) or (24 | c) or (24 | d) in box | (25) | | | | | |
| 5)m= 0.58 | 0.58 | 0.57 | 0.56 | 0.56 | 0.54 | 0.54 | 0.54 | 0.55 | 0.56 | 0.56 | 0.57 | | (|
| B. Heat losse | s and he | eat loss r | paramet | er: | | | | | | | | | |
| LEMENT | Gros area | SS | Openin m | gs | Net Ar A ,r | | U-valı W/m2 | | A X U (W/ | | k-value kJ/m²-l | | A X k kJ/K |
| oors | | | | | 2 | х | 1 | - | 2 | | | | |
| indows | | | | | 8.651 | x1 | /[1/(1.4)+ | 0.04] = | 11.47 | | | | |
| oor | | | | | 67.73 | 9 x | 0.13 | - | 8.80606 | 9 | | $\neg \vdash$ | |
| alls Type1 | 50.9 | 9 | 8.65 | | 42.34 | × | 0.18 | = | 7.62 | T i | | 7 F | |
| alls Type2 | 21.2 | 26 | 2 | | 19.26 | x | 0.18 | = | 3.47 | T i | | 7 F | |
| alls Type3 | 18.0 |)2 | 0 | | 18.02 | 2 x | 0.18 | = | 3.24 | T i | | 7 F | |
| oof Type1 | 5.7 | - | 0 | = | 5.7 | x | 0.13 | = | 0.74 | ₹ i | | 7 F | |
| oof Type2 | 4.12 | 2 | 0 | | 4.12 | x | 0.13 | = | 0.54 | F i | | 7 F | |
| otal area of e | elements | , m² | | | 167.8 | 2 | | | | | | | |
| or windows and include the area | | | | | | ated using | g formula 1 | /[(1/U-valu | ıe)+0.04] a | as given in | paragraph | 1 3.2 | |
| bric heat los | ss, W/K : | = S (A x | U) | | | | (26)(30) | + (32) = | | | | 37.88 | |
| eat capacity | Cm = S(| (Axk) | | | | | | ((28). | (30) + (3 | 2) + (32a). | (32e) = | 8654.2 | 7 |
| nermal mass | parame | ter (TMF | P = Cm - | - TFA) ir | ı kJ/m²K | | | Indica | tive Value | : Medium | | 250 | (|
| r design assess n be used inste | ad of a de | tailed calc | ulation. | | | | recisely the | indicative | e values of | TMP in T | able 1f | | |
| nermal bridg | • | , | | | • | < | | | | | | 12.71 | |
| letails of therma otal fabric he | | are not kn | own (36) = | = 0.05 x (3 | 1) | | | (33) + | (36) = | | | 50.59 | |
| entilation hea | | alculated | l monthly | / | | | | | = 0.33 × (| (25)m x (5) |) | | ' |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| 32.39 | 32.22 | 32.05 | 31.25 | 31.1 | 30.41 | 30.41 | 30.28 | 30.68 | 31.1 | 31.4 | 31.72 | | (|
| eat transfer | coefficier | nt. W/K | | | | | | (39)m | = (37) + (| 38)m | 1 | ı | |
| 9)m= 82.98 | 82.81 | 82.64 | 81.84 | 81.69 | 81 | 81 | 80.87 | 81.27 | 81.69 | 81.99 | 82.31 |] | |
| , | l | L | | | | l | | l <u></u> . | 1 | 1 | 1 | Ī | |

| Heat loss para | ameter (l | HLP), W | ′m²K | | | | | (40)m | = (39)m ÷ | · (4) | | | |
|--|-------------|--------------|-------------|-----------------------|-------------|----------------|-------------|--------------|-------------|------------------------|----------|---------|------|
| (40)m= 1.22 | 1.22 | 1.22 | 1.21 | 1.21 | 1.2 | 1.2 | 1.19 | 1.2 | 1.21 | 1.21 | 1.22 | | |
| | ! | | | ļ . | <u> </u> | ļ | <u> </u> | ' | Average = | Sum(40) ₁ . | 12 /12= | 1.21 | (40) |
| Number of day | ys in mo | nth (Tab | le 1a) | | | | | 1 | 1 | 1 | | | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (41)m= 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | | (41) |
| | | | | | | | | | | | | | |
| 4. Water hea | ting ene | rgy requi | rement: | | | | | | | | kWh/ye | ear: | |
| Assumed occu if TFA > 13. if TFA £ 13. | 9, N = 1 | | [1 - exp | 0.0003 | 349 x (TI | FA -13.9 |)2)] + 0.0 | 0013 x (¯ | TFA -13: | | 19 | | (42) |
| Annual average Reduce the annual not more that 125 | al average | hot water | usage by | 5% if the α | lwelling is | designed t | ` , | | se target o | | .21 | | (43) |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Hot water usage i | | 1 | | | | | | ·' | | | <u> </u> | | |
| (44)m= 94.83 | 91.39 | 87.94 | 84.49 | 81.04 | 77.59 | 77.59 | 81.04 | 84.49 | 87.94 | 91.39 | 94.83 | | |
| | • | • | | | ! | ! | ! | | | m(44) ₁₁₂ = | | 1034.55 | (44) |
| Energy content of | f hot water | used - cal | culated m | onthly = 4. | 190 x Vd,ı | n x nm x C | OTm / 3600 |) kWh/mor | nth (see Ta | ables 1b, 1 | c, 1d) | | |
| (45)m= 140.64 | 123 | 126.93 | 110.66 | 106.18 | 91.62 | 84.9 | 97.43 | 98.59 | 114.9 | 125.42 | 136.2 | | _ |
| If instantaneous v | vater heat | ina at noint | of use (no | n hot water | r storage) | enter∩in | hoves (46 | | Total = Su | m(45) ₁₁₂ = | = | 1356.46 | (45) |
| | | 1 | | | | | | | l | l 0 | | | (46) |
| (46)m= 0 Water storage | loss: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (46) |
| Storage volum | |) includir | ig any so | olar or W | /WHRS | storage | within sa | ame ves | sel | | 150 | | (47) |
| If community h | neating a | and no ta | nk in dw | velling, e | nter 110 | litres in | (47) | | | | | | |
| Otherwise if no | o stored | hot wate | er (this in | ncludes i | nstantar | neous co | mbi boil | ers) ente | er '0' in (| 47) | | | |
| Water storage | | | | | (1.3.4.(1 | <i>,</i> , , , | | | | | | | |
| a) If manufact | | | | or is kno | wn (kWl | n/day): | | | | | 0 | | (48) |
| Temperature f | | | | | | | | | | | 0 | | (49) |
| Energy lost from b) If manufact | | _ | - | | or io not | | (48) x (49) |) = | | | 0 | | (50) |
| Hot water stor | | | - | | | | | | | | 0 | | (51) |
| If community h | • | | | • | | , | | | | | <u> </u> | | ` ' |
| Volume factor | from Ta | ıble 2a | | | | | | | | | 0 | | (52) |
| Temperature f | actor fro | m Table | 2b | | | | | | | | 0 | | (53) |
| Energy lost fro | | • | , kWh/ye | ear | | | (47) x (51) |) x (52) x (| 53) = | | 0 | | (54) |
| Enter (50) or | ` , ` ` | , | | | | | | | | | 0 | | (55) |
| Water storage | loss ca | lculated f | or each | month | | | ((56)m = (| (55) × (41) | m | | | | |
| (56)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (56) |
| If cylinder contain | s dedicate | d solar sto | rage, (57) | m = (56)m | x [(50) – (| H11)] ÷ (5 | 0), else (5 | 7)m = (56) | m where (| H11) is fro | m Append | ix H | |
| (57)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (57) |
| Primary circuit | loss (ar | nnual) fro | m Table | e 3 | | | | | | | 0 | | (58) |
| Primary circuit | • | • | | | 59)m = | (58) ÷ 36 | 65 × (41) | m | | | | | |
| (modified by | / factor f | rom Tab | le H5 if t | here is s | solar wa | ter heatii | ng and a | cylinde | r thermo | stat) | | | |
| (59)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (59) |

| Combiles a | Combi loss calculated for each month (61) m = $(60) \div 365 \times (41)$ m | | | | | | | | | | | | | |
|----------------------------|---|------------|------------|-------------------|------------|---------------|-------------|----------------|-------------|---------------|--------------|---------------|-------|--|
| (61)m= 0 | alculated | or each | montn (| $\frac{(61)m}{0}$ | (60) ÷ 3 | 05 × (41 |)m 0 | 0 | 0 | 0 | 0 | | (61) | |
| (*) | _! | <u> </u> | | | | | <u> </u> | Ļ | <u> </u> | <u> </u> | <u> </u> | (F0)m + (G1)m | (01) | |
| (62)m= 119.5 | | 107.89 | 94.06 | 90.25 | 77.88 | 72.17 | 82.81 | 83.8 | 97.66 | 106.61 | 115.77 | (59)m + (61)m | (62) | |
| Solar DHW inpu | | LI | | | | | | 1 | | | | | (02) | |
| (add addition | | | | | | | | | ii continou | iion to watt | or ricating) | | | |
| (63)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) | |
| Output from | water hea | ter | | | | | | | | Į | | l | | |
| (64)m= 119.5 | | 107.89 | 94.06 | 90.25 | 77.88 | 72.17 | 82.81 | 83.8 | 97.66 | 106.61 | 115.77 | | | |
| | | <u> </u> | | <u> </u> | | ļ. | Ou | put from w | ater heate | r (annual)₁ | l12 | 1152.99 | (64) | |
| Heat gains fr | om water | heating, | kWh/m | onth 0.2 | 5 ´ [0.85 | 5 × (45)m | ı + (61)ı | n] + 0.8 x | x [(46)m | + (57)m | + (59)m | 1 | - | |
| (65)m= 29.89 | 1 | 26.97 | 23.51 | 22.56 | 19.47 | 18.04 | 20.7 | 20.95 | 24.42 | 26.65 | 28.94 |] | (65) | |
| include (57 | 7)m in cald | culation o | of (65)m | only if c | ylinder | is in the | dwelling | or hot w | ater is f | rom com | munity h | neating | | |
| 5. Internal | <u> </u> | | | | - | | | | | | , | | | |
| Metabolic ga | | | | , | | | | | | | | | | |
| Jan | 1 | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | | |
| (66)m= 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | | (66) | |
| Lighting gain | s (calcula | ted in Ap | pendix | L, equat | ion L9 c | r L9a), a | lso see | Table 5 | | | | • | | |
| (67)m= 18.74 | 16.64 | 13.53 | 10.25 | 7.66 | 6.47 | 6.99 | 9.08 | 12.19 | 15.48 | 18.06 | 19.26 | | (67) | |
| Appliances g | ains (calc | ulated in | Append | dix L, eq | uation L | .13 or L1 | 3a), als | o see Ta | ble 5 | | | • | | |
| (68)m= 191.9 | 6 193.96 | 188.94 | 178.25 | 164.76 | 152.08 | 143.61 | 141.62 | 146.64 | 157.33 | 170.82 | 183.49 | | (68) | |
| Cooking gair | ns (calcula | ted in Ap | pendix | L, equat | ion L15 | or L15a |), also s | ee Table | 5 | | | • | | |
| (69)m= 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | | (69) | |
| Pumps and f | ans gains | (Table 5 | ia) | | | | | | | | | | | |
| (70)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (70) | |
| Losses e.g. | evaporatio | n (negat | ive valu | es) (Tab | le 5) | | | | | | | | | |
| (71)m= -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | | (71) | |
| Water heatin | g gains (T | able 5) | | | | | | | | | | _ | | |
| (72)m= 40.17 | 38.9 | 36.25 | 32.66 | 30.33 | 27.04 | 24.25 | 27.83 | 29.1 | 32.82 | 37.02 | 38.9 | | (72) | |
| Total interna | al gains = | | | | (66 | s)m + (67)m | n + (68)m | + (69)m + | (70)m + (7 | 71)m + (72) |)m | _ | | |
| (73)m= 306.7 | 2 305.34 | 294.57 | 277 | 258.59 | 241.44 | 230.7 | 234.38 | 243.78 | 261.47 | 281.74 | 297.5 | | (73) | |
| 6. Solar gai | | | | | | | | | | | | | | |
| Solar gains are | | • | | | | • | ations to c | onvert to th | ne applica | | tion. | | | |
| Orientation: | Access F Table 6d | | Area m² | | Flu Ta | ıx ıble 6a | - | g_ Fable 6b | т | FF able 6c | | Gains (W) | | |
| 0 | | | | | | | , – | | _ | | | ` ' | 1 | |
| Southwesto.9x | | X | 8.6 | | - | 36.79 | ļ Ļ | 0.63 | X | 0.7 | = | 97.28 | (79) | |
| Southwesto.9x | <u> </u> | X | 8.6 | | - | 62.67 | ļ ⊨ | 0.63 | | 0.7 | = | 165.7 | [(79) | |
| Southwesto.9x | | X | 8.6 | | | 85.75 | ┆╶┝ | 0.63 | × | 0.7 | = | 226.72 |](79) | |
| Southwesto.9x | | X | 8.6 | | - | 06.25 | ļ Ļ | 0.63 | | 0.7 | = | 280.91 | (79) | |
| Southwest _{0.9} x | 0.77 | X | 8.6 | 35 | X 1 | 19.01 | | 0.63 | X | 0.7 | = | 314.65 | (79) | |

| Southwest _{0.9x} 0 | 77 × | 8.6 | 35 | x | 118.15 | | 0.63 | x | 0.7 | = | 312.37 | (79) |
|---|--------------|------------|------------|----------|-------------------|---------------|--------------|--------------|--------------|-----------|--------|------|
| Southwest _{0.9x} 0 | 77 x | 8.6 | 35 | x | 113.91 | | 0.63 | x | 0.7 | = | 301.16 | (79) |
| Southwest _{0.9x} 0 | 77 × | 8.6 | 35 | x | 104.39 | | 0.63 | x | 0.7 | = | 275.99 | (79) |
| Southwest _{0.9x} | 77 × | 8.6 | 35 | x | 92.85 | | 0.63 | x | 0.7 | = | 245.49 | (79) |
| Southwest _{0.9x} 0 | 77 x | 8.6 | 35 | x | 69.27 | | 0.63 | x | 0.7 | = | 183.13 | (79) |
| Southwest _{0.9x} 0 | 77 × | 8.6 | 35 | x [| 44.07 | Ī [| 0.63 | x | 0.7 | | 116.52 | (79) |
| Southwest _{0.9x} 0 | 77 × | 8.6 | 35 | x [| 31.49 | Ī [| 0.63 | x | 0.7 | = | 83.25 | (79) |
| | | | | | | | | | | | | |
| Solar gains in watts | calculated | for eac | h month | | | (83)m | = Sum(74)m | (82)m | | | • | |
| (83)m= 97.28 165. | | 280.91 | 314.65 | | 2.37 301.16 | 275.9 | 99 245.49 | 183.13 | 116.52 | 83.25 | | (83) |
| Total gains – interna | | <u> </u> | <u> </u> | · | ' | 1 | | | 1 | ı | 1 | |
| (84)m= 403.99 471. | 521.29 | 557.92 | 573.24 | 553 | 3.81 531.86 | 510.3 | 37 489.26 | 444.6 | 398.26 | 380.75 | | (84) |
| 7. Mean internal te | mperature | (heating | season |) | | | | | | | | |
| Temperature durin | g heating p | eriods ir | n the livi | ng a | rea from Ta | ble 9, | Th1 (°C) | | | | 21 | (85) |
| Utilisation factor fo | r gains for | living are | ea, h1,m | (se | e Table 9a) | | | | | 1 | • | |
| Jan Fe | b Mar | Apr | May | J | un Jul | Au | g Sep | Oct | Nov | Dec | | |
| (86)m= 1 1 | 0.99 | 0.97 | 0.92 | 0 | .8 0.64 | 0.68 | 0.88 | 0.98 | 1 | 1 | | (86) |
| Mean internal tem | erature in | living are | ea T1 (fo | ollov | steps 3 to | 7 in Ta | able 9c) | | | | | |
| (87)m= 19.66 19.8 | 2 20.07 | 20.39 | 20.68 | 20 | 0.9 20.97 | 20.9 | 6 20.82 | 20.43 | 19.98 | 19.63 | | (87) |
| Temperature durin | g heating p | eriods ir | n rest of | dwe | elling from T | able 9 | , Th2 (°C) | | | | | |
| (88)m= 19.9 19.9 | 19.9 | 19.91 | 19.92 | 19 | .92 19.92 | 19.9 | 2 19.92 | 19.92 | 19.91 | 19.91 | | (88) |
| Utilisation factor fo | r gains for | rest of d | wellina. | h2.n | n (see Table | 9a) | • | • | • | • | • | |
| (89)m= 1 0.99 | <u> </u> | 0.96 | 0.89 | T | 71 0.5 | 0.54 | 1 0.82 | 0.97 | 0.99 | 1 | | (89) |
| Mean internal tem | erature in | the rest | of dwelli | ina T | Γ2 (follow st | ens 3 | to 7 in Tah | le 9c) | | | | |
| (90)m= 18.68 18.8 | | 19.41 | 19.69 | | .87 19.92 | 19.9 | ı | 19.46 | 19.01 | 18.66 | | (90) |
| | -! | l | | <u> </u> | · | <u> </u> | <u> </u> | fLA = Livii | ng area ÷ (4 | 4) = | 0.43 | (91) |
| Mean internal tem | ocraturo (fo | or the wh | ole dwe | lling |) _ fl Λ ∨ T1 | ± (1 _ | - fl Λ\ ∨ ΤΩ | ı | | | | |
| (92)m= 19.1 19.2 | <u> </u> | 19.83 | 20.12 | Ť | .31 20.37 | 20.3 | | 19.88 | 19.43 | 19.08 | | (92) |
| Apply adjustment t | | | | | | | | <u> </u> | 1 | | | , , |
| (93)m= 19.1 19.2 | | 19.83 | 20.12 | ī | .31 20.37 | 20.3 | | 19.88 | 19.43 | 19.08 | | (93) |
| 8. Space heating r | equiremen | | | | · · | • | • | | • | | | |
| Set Ti to the mean | | | | ned a | at step 11 o | f Table | 9b, so tha | at Ti,m= | (76)m an | d re-calc | culate | |
| the utilisation factor | | | l | | <u> </u> | 1 . | 1 - | | 1 | _ | Ī | |
| Jan Fe | | Apr | May | J | un Jul | Au | g Sep | Oct | Nov | Dec | | |
| Utilisation factor for (94) m= 1 0.99 | <u> </u> | 0.96 | 0.89 | <u> </u> | 75 0.56 | 0.6 | 0.84 | 0.97 | 0.99 | 1 | | (94) |
| Useful gains, hmG | | | <u> </u> | 0. | 73 0.30 | 0.0 | 0.04 | 0.97 | 0.99 | <u>'</u> | | (01) |
| (95)m= 402.66 467. | | 535.02 | 512.86 | 414 | 4.18 296.52 | 307.0 | 62 410.05 | 430.05 | 395.55 | 379.8 | | (95) |
| Monthly average e | | | | L | | ļ | | ļ | | | | |
| (96)m= 4.3 4.9 | i | 8.9 | 11.7 | _ | 1.6 16.6 | 16.4 | 1 14.1 | 10.6 | 7.1 | 4.2 | | (96) |
| Heat loss rate for r | nean interr | al tempe | erature, | Lm | , W =[(39)m | x [(93 |)m– (96)m |] | | | | |
| (97)m= 1228.21 1189 | 37 1075.23 | 894.67 | 687.81 | 462 | 2.91 305.62 | 320.8 | 499.88 | 758.09 | 1011.09 | 1224.36 | | (97) |
| Space heating req | | r | r | | 1 | 24 x [(| 97)m – (95 | i | T | | ı | |
| (98)m= 614.21 485 | 418.44 | 258.95 | 130.16 | | 0 0 | 0 | 0 | 244.06 | 443.18 | 628.35 | | |

| Total per year (kWh/year) = Sum(98) ₁₅ , | | | | | | | | | | | | | 3222.34 | (98) |
|---|--------------|------------|---------------------------|-----------|-----------|-----------|-----------|-------------|-----------|-----------|-----------|-----------|---------|-----------|
| Space | e heating | g require | ement in | kWh/m² | /year | | | | | | | | 47.57 | (99) |
| 8c. Sp | oace cod | oling req | uiremen | it | | | | | | | | | | |
| Calcu | lated for | r June, J | luly and | August. | See Tal | ole 10b | | | | | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Heat I | loss rate | Lm (ca | lculated | using 25 | 5°C inter | | perature | and exte | ernal ten | nperatur | e from T | able 10) | | |
| (100)m= | 0 | 0 | 0 | 0 | 0 | 761.41 | 599.41 | 614.64 | 0 | 0 | 0 | 0 | | (100) |
| Utilisa | ation fac | tor for lo | ss hm | | | | | | | | | | , | |
| (101)m= | 0 | 0 | 0 | 0 | 0 | 0.81 | 0.89 | 0.87 | 0 | 0 | 0 | 0 | | (101) |
| Usefu | l loss, h | mLm (V | /atts) = (| 100)m x | (101)m | | | | | | | | , | |
| (102)m= | 0 | 0 | 0 | 0 | 0 | 617.82 | 532.35 | 533.62 | 0 | 0 | 0 | 0 | | (102) |
| Gains | (solar g | gains cal | culated | for appli | cable we | eather re | gion, se | e Table | 10) | | | | - | |
| (103)m= | 0 | 0 | 0 | 0 | 0 | 729.43 | 702.2 | 678.62 | 0 | 0 | 0 | 0 | | (103) |
| | | | <i>ment fo</i> 104)m < | | | lwelling, | continue | ous (kW | h = 0.0 | 24 x [(10 | 03)m – (| 102)m] : | x (41)m | |
| (104)m= | | 0 | 0 | 0 7 (30 | 0 | 80.36 | 126.37 | 107.88 | 0 | 0 | 0 | 0 |] | |
| (101) | | | | | | | | | | = Sum(| | = | 314.61 | (104) |
| Cooled | fraction | 1 | | | | | | | | | area ÷ (4 | | 1 | (105) |
| Intermi | ttency fa | actor (Ta | able 10b |) | | | | | | | ` | , | | ` |
| (106)m= | 0 | 0 | 0 | 0 | 0 | 0.25 | 0.25 | 0.25 | 0 | 0 | 0 | 0 | | |
| | | | | | | | | | Total | = Sum(| 104) | = | 0 | (106) |
| Space | cooling | requirer | nent for | month = | (104)m | × (105) | × (106)r | n | | | | | | _ |
| (107)m= | 0 | 0 | 0 | 0 | 0 | 20.09 | 31.59 | 26.97 | 0 | 0 | 0 | 0 | | |
| • | | | | | | | | | Total | = Sum(| 107) | = | 78.65 | (107) |
| Space | cooling | requirer | nent in k | :Wh/m²/y | /ear | | | | (107) | ÷ (4) = | | | 1.16 | (108) |
| 8f. Fab | ric Ener | gy Effici | ency (ca | alculated | only un | der spec | cial cond | litions, se | ee sectio | on 11) | | | | |
| Fabrio | c Energy | / Efficier | псу | | | | | | (99) - | + (108) = | = | | 48.73 | (109) |
| Targe | et Fabrio | Energ | y Efficie | ency (TF | EE) | | | | | | | | 56.04 | (109) |

| User Details: | |
|--|--------------|
| Assessor Name: Zahid Ashraf Stroma Number: STRO001 Software Name: Stroma FSAP 2012 Software Version: Version: 1 | |
| Property Address: Plot 2 Address: | |
| 1. Overall dwelling dimensions: | |
| Š | olume(m³) |
| Ground floor 67.74 (1a) x 2.5 (2a) = | 169.35 (3a) |
| Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 67.74 (4) | |
| Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ | 169.35 (5) |
| 2. Ventilation rate: | |
| main secondary other total n heating heating | n³ per hour |
| Number of chimneys $0 + 0 = 0 \times 40 =$ | 0 (6a) |
| Number of open flues $0 + 0 + 0 = 0 \times 20 =$ | 0 (6b) |
| Number of intermittent fans 0 x 10 = | 0 (7a) |
| Number of passive vents 0 x 10 = | 0 (7b) |
| Number of flueless gas fires 0 × 40 = | 0 (7c) |
| | |
| Air chanç | ges per hour |
| Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0 \div (5) =$ | 0 (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]x0.1 = | 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 | 3 (17) |
| If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used | 0.15 (18) |
| Number of sides sheltered | 2 (19) |
| Shelter factor (20) = 1 - [0.075 x (19)] = | 0.85 (20) |
| Infiltration rate incorporating shelter factor (21) = (18) x (20) = | 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 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 | |
| Wind Factor (22a)m = (22)m ÷ 4 | |
| Willia Factor (22a)III = $(22a)III = 4$ | |

| Adjusted infiltration rate (allowing for shelter | and wind speed) = | (21a) x (22 | 2a)m | | | | |
|---|---|--|-------------------------------|----------------------|--------------------|---------------------|----------|
| 0.16 0.16 0.16 0.14 0.14 | - i | ì í ì | 0.13 0.14 | 0.14 | 0.15 | | |
| Calculate effective air change rate for the ap | pplicable case | I | <u> </u> | | | | _ |
| If mechanical ventilation: | (00-) Fame (a amosticae (1) | 15\\ | (00h) (00 -) | | ļ | 0.5 | (23a) |
| If exhaust air heat pump using Appendix N, (23b) = (| . , | | se (23b) = (23a) | | [| 0.5 | (23b) |
| If balanced with heat recovery: efficiency in % allowi | | | (001) | 001) [4 | (00.) | 79.05 | (23c) |
| a) If balanced mechanical ventilation with | | - | ` ' ' ` | | <u> </u> | ÷ 100] | (24a) |
| (24a)m= 0.27 0.26 0.26 0.25 0.24 | | | 0.23 0.24 | 0.25 | 0.25 | | (24a) |
| b) If balanced mechanical ventilation with | | - | ```` | | 0 | | (24b) |
| (24b)m= 0 0 0 0 0 0 | 0 0 | 0 | 0 0 | 0 | 0 | | (240) |
| c) If whole house extract ventilation or positif $(22b)m < 0.5 \times (23b)$, then $(24c) = (25c)$ | • | | |)) | | | |
| (24c)m= 0 0 0 0 0 | 0 0 | 0 | 0 0 | 0 | 0 | | (24c) |
| d) If natural ventilation or whole house pos | sitive input ventilation | on from loft | <u> </u> | | | | |
| if (22b)m = 1, then (24d)m = (22b)m o | • | | | | | | |
| (24d)m= 0 0 0 0 0 | 0 0 | 0 | 0 0 | 0 | 0 | | (24d) |
| Effective air change rate - enter (24a) or (24a) | 24b) or (24c) or (24 | d) in box (2 | 25) | | | | |
| (25)m= 0.27 0.26 0.26 0.25 0.26 | 4 0.23 0.23 | 0.22 | 0.23 0.24 | 0.25 | 0.25 | | (25) |
| 3. Heat losses and heat loss parameter: | | | | | | | |
| ELEMENT Gross Openings area (m²) m² | Net Area A ,m² | U-value W/m2K | A X U (W/i | () | k-value kJ/m².ł | | |
| Doors | 2 x | 1.4 | 2.8 | , | 1.0/111 | 1.0, | (26) |
| Windows | | /[1/(1.4)+ 0.0 | J <u> </u> | = | | | (27) |
| Floor | 67.739 × | 0.12 | = 8.128679 | | | | (28) |
| | | | { | <u>"</u> | | | (29) |
| Walls Table | 42.34 X | 0.15 | = 6.35 | - | | ╣ | ╡ . |
| | 19.26 × | 0.14 | = 2.76 | - | | ╣ ├── | (29) |
| Walls Type3 18.02 0 | 18.02 X | 0.13 | = 2.41 | 닠 ¦ | | ╣ | (29) |
| Roof Type1 5.7 0 | 5.7 × | 0.1 | = 0.57 | ᆜ | | _ | (30) |
| Roof Type2 4.12 0 | 4.12 X | 0.1 | = 0.41 | L | | | (30) |
| Total area of elements, m ² | 167.82 | | | | | | (31) |
| * for windows and roof windows, use effective window ** include the areas on both sides of internal walls and | • | g formula 1/[(1/ | /U-value)+0.04] a | is given in | paragraph | 3.2 | |
| Fabric heat loss, $W/K = S (A \times U)$ | , | (26)(30) + (| (32) = | | | 34.9 | (33) |
| Heat capacity Cm = S(A x k) | | | ((28)(30) + (32 | 2) + (32a) | .(32e) = | 8654.27 | (34) |
| Thermal mass parameter (TMP = Cm ÷ TFA | a) in kJ/m²K | | Indicative Value: | Low | ļ | 100 | (35) |
| For design assessments where the details of the const. can be used instead of a detailed calculation. | ruction are not known pr | ecisely the inc | dicative values of | TMP in Ta | able 1f | | _ |
| Thermal bridges : S (L x Y) calculated using | Appendix K | | | | I | 13.2 | (36) |
| if details of thermal bridging are not known (36) = 0.05 | • • | | | | I | | ` ′ |
| Total fabric heat loss | | | (33) + (36) = | | | 48.09 | (37) |
| Ventilation heat loss calculated monthly | | | (38) m = $0.33 \times (38)$ | 25)m x (5) | | | |
| Jan Feb Mar Apr Ma | ay Jun Jul | Aug | Sep Oct | Nov | Dec | | |
| (38)m= 14.94 14.76 14.58 13.69 13.5 | 12.62 12.62 | 12.44 1 | 12.98 13.51 | 13.87 | 14.23 | | (38) |
| Heat transfer coefficient, W/K | | | (39)m = (37) + (37) | 38)m | | | |
| (39)m= 63.03 62.86 62.68 61.79 61.6 | 61 60.72 60.72 | 60.54 6 | 61.61 | 61.96 | 62.32 | | _ |
| Stroma FSAP 2012 Version: 1.0.5.9 (SAP 9.92) - http:// | /www.stroma.com | | Average = | Sum(39) ₁ | .12 /12= | 61.7 ≱ age : | 2 of 39) |

| Heat loss para | ımeter (I | HLP), W | ′m²K | | | | | (40)m | = (39)m ÷ | · (4) | | | |
|--|-----------------------|-------------|-------------|-------------|-------------|------------|-------------|-----------------------|-------------|------------------------|----------|---------|-------|
| (40)m= 0.93 | 0.93 | 0.93 | 0.91 | 0.91 | 0.9 | 0.9 | 0.89 | 0.9 | 0.91 | 0.91 | 0.92 | | |
| | | | | | | l | l | | Average = | Sum(40) ₁ . | 12 /12= | 0.91 | (40) |
| Number of day | 1 | nth (Tab | le 1a) | | | | | ı | 1 | i | | | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (41)m= 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | | (41) |
| | | | | | | | | | | | | | |
| 4. Water heat | ting ene | rgy requi | rement: | | | | | | | | kWh/ye | ear: | |
| Assumed occu if TFA > 13.9 if TFA £ 13.9 | 9, N = 1 | | [1 - exp | (-0.0003 | 349 x (TF | FA -13.9 |)2)] + 0.0 | 0013 x (⁻ | TFA -13 | | 19 | | (42) |
| Annual averag Reduce the annua not more that 125 | al average | hot water | usage by | 5% if the a | welling is | designed t | | | se target o | | .75 | | (43) |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Hot water usage in | | | | , | | | | *F | | | | | |
| (44)m= 99.83 | 96.2 | 92.57 | 88.94 | 85.31 | 81.68 | 81.68 | 85.31 | 88.94 | 92.57 | 96.2 | 99.83 | | |
| | | | | | | | | | Total = Su | m(44) ₁₁₂ = | | 1089 | (44) |
| Energy content of | hot water | used - cal | culated mo | onthly = 4. | 190 x Vd,r | n x nm x C | OTm / 3600 |) kWh/mor | nth (see Ta | ables 1b, 1 | c, 1d) | | |
| (45)m= 148.04 | 129.47 | 133.61 | 116.48 | 111.77 | 96.45 | 89.37 | 102.56 | 103.78 | 120.95 | 132.02 | 143.37 | | _ |
| If instantaneous w | vater heati | na at noint | of use (no | hot water | etoraga) | enter∩in | hoves (16 | | Total = Su | m(45) ₁₁₂ = | = | 1427.85 | (45) |
| | | · · | , | | | | · · · | , , , - | | | | | (40) |
| (46)m= 22.21 Water storage | 19.42 loss: | 20.04 | 17.47 | 16.76 | 14.47 | 13.41 | 15.38 | 15.57 | 18.14 | 19.8 | 21.51 | | (46) |
| Storage volum | |) includir | ig any so | olar or W | /WHRS | storage | within sa | ame ves | sel | | 0 | | (47) |
| If community h | neating a | and no ta | nk in dw | elling, e | nter 110 | litres in | (47) | | | | | | |
| Otherwise if no | o stored | hot wate | er (this in | icludes i | nstantar | neous co | mbi boil | ers) ente | er '0' in (| 47) | | | |
| Water storage | | | | | | | | | | | | | |
| a) If manufact | | | | or is kno | wn (kWh | n/day): | | | | | 0 | | (48) |
| Temperature f | | | | | | | | | | | 0 | | (49) |
| Energy lost fro | | • | | | or io not | | (48) x (49) |) = | | 1 | 10 | | (50) |
| b) If manufactHot water stora | | | - | | | | | | | 0 | 02 | | (51) |
| If community h | - | | | - (| ., | -77 | | | | <u>_</u> | <u> </u> | | (5.7) |
| Volume factor | from Ta | ble 2a | | | | | | | | 1. | 03 | | (52) |
| Temperature f | actor fro | m Table | 2b | | | | | | | 0 | .6 | | (53) |
| Energy lost fro | | _ | , kWh/ye | ear | | | (47) x (51) |) x (52) x (| 53) = | 1. | 03 | | (54) |
| Enter (50) or (| (54) in (| 55) | | | | | | | | 1. | 03 | | (55) |
| Water storage | loss cal | culated f | or each | month | _ | | ((56)m = (| (55) × (41) | m | | | | |
| (56)m= 32.01 | 28.92 | 32.01 | 30.98 | 32.01 | 30.98 | 32.01 | 32.01 | 30.98 | 32.01 | 30.98 | 32.01 | | (56) |
| If cylinder contains | s dedicate | d solar sto | rage, (57)ı | m = (56)m | x [(50) – (| H11)] ÷ (5 | 0), else (5 | 7)m = (56) | m where (| H11) is fro | m Append | ix H | |
| (57)m= 32.01 | 28.92 | 32.01 | 30.98 | 32.01 | 30.98 | 32.01 | 32.01 | 30.98 | 32.01 | 30.98 | 32.01 | | (57) |
| Primary circuit | loss (ar | nnual) fro | m Table | 3 | _ | | | | | | 0 | | (58) |
| Primary circuit | ` | , | | | 59)m = (| (58) ÷ 36 | 65 × (41) | m | | | | | |
| (modified by | factor f | rom Tab | le H5 if t | here is s | olar wat | ter heatii | ng and a | cylinde | r thermo | stat) | | | |
| (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) ± 3 | 165 ~ (11 |)m | | | | | | |
|--------------------------|----------------------|-----------|------------|-----------|-----------|------------------|-----------|----------------|------------|---------------|---------------|----------------------|----------------------------|
| (61)m= 0 | 0 0 | 0 | 0 | 0 1)111 = | 00) + 0 | 0 7 (41 |) o | T 0 | 0 | 0 | 0 | 1 | (61) |
| | Ļ | | | | | | | | | | <u> </u> | J · (59)m + (61)m | (-) |
| (62)m= 203.3 | -i | 188.88 | 169.98 | 167.04 | 149.94 | 144.65 | 157.8 | | 176.22 | 185.52 | 198.64 |] | (62) |
| Solar DHW inp | | | | | | 1 | ļ.,,,,, | | | 1 | | <u> </u> | (-) |
| (add additio | | | | | | | | | | iioir to wat | or riodairig, | • | |
| (63)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | (63) |
| Output from | water hea | ter | ! | | | ! | ļ. | | ļ. | ļ | ! | J | |
| (64)m= 203.3 | _ | 188.88 | 169.98 | 167.04 | 149.94 | 144.65 | 157.8 | 3 157.27 | 176.22 | 185.52 | 198.64 | 1 | |
| | | <u> </u> | ! | l . | <u> </u> | | 0 | utput from w | ater heate | er (annual) | l12 | 2078.69 | (64) |
| Heat gains t | rom water | heating, | , kWh/m | onth 0.2 | 5 ´ [0.85 | 5 × (45)m | า + (61 |)m] + 0.8 | x [(46)m | + (57)m | + (59)m | n] | _ |
| (65)m= 93.4 | | 88.65 | 81.52 | 81.38 | 74.86 | 73.94 | 78.32 | | 84.44 | 86.69 | 91.89 | 1 | (65) |
| include (5 | 7)m in cal | culation | of (65)m | only if c | ylinder | is in the | dwellir | ng or hot w | ater is f | rom com | munity h | neating | |
| 5. Internal | gains (see | e Table 5 | and 5a |): | • | | | | | | | | |
| Metabolic g | ains (Table | e 5), Wat | ts | | | | | | | | | | |
| Jai | n Feb | Mar | Apr | May | Jun | Jul | Au | g Sep | Oct | Nov | Dec |] | |
| (66)m= 131. | 4 131.4 | 131.4 | 131.4 | 131.4 | 131.4 | 131.4 | 131.4 | 131.4 | 131.4 | 131.4 | 131.4 |] | (66) |
| Lighting gai | ns (calcula | ted in Ap | opendix | L, equat | ion L9 d | or L9a), a | ılso se | e Table 5 | | | | | |
| (67)m= 46.8 | 4 41.6 | 33.83 | 25.61 | 19.15 | 16.16 | 17.47 | 22.7 | 30.47 | 38.69 | 45.16 | 48.14 |] | (67) |
| Appliances | gains (calc | ulated in | Append | dix L, eq | uation L | 13 or L1 | 3a), a | so see Ta | ble 5 | | | | |
| (68)m= 286.5 | 289.49 | 281.99 | 266.04 | 245.91 | 226.99 | 214.35 | 211.3 | 7 218.86 | 234.81 | 254.95 | 273.87 | | (68) |
| Cooking gai | ns (calcula | ated in A | ppendix | L, equat | ion L15 | or L15a |), also | see Table | 5 | | | | |
| (69)m= 50.3 | 3 50.33 | 50.33 | 50.33 | 50.33 | 50.33 | 50.33 | 50.33 | 50.33 | 50.33 | 50.33 | 50.33 | | (69) |
| Pumps and | fans gains | (Table 5 | 5a) | | | | | | | | | | |
| (70)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (70) |
| Losses e.g. | evaporatio | n (nega | tive valu | es) (Tab | le 5) | | | | | | | _ | |
| (71)m= -87. | 6 -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 |] | (71) |
| Water heati | ng gains (T | able 5) | | | | | | | | | | _ | |
| (72)m= 125. | 6 123.5 | 119.15 | 113.23 | 109.39 | 103.98 | 99.38 | 105.2 | 7 107.36 | 113.49 | 120.41 | 123.51 |] | (72) |
| Total interr | al gains = | | | | (66 | 6)m + (67)n | n + (68) | m + (69)m + | (70)m + (7 | 71)m + (72) |)m | _ | |
| (73)m= 553.0 | 08 548.72 | 529.1 | 499.02 | 468.57 | 441.26 | 425.32 | 433.4 | 8 450.83 | 481.12 | 514.64 | 539.65 | | (73) |
| 6. Solar ga | | | | | | | | | | | | | |
| Solar gains a | | Ü | | | | • | ations to | | ne applica | | tion. | | |
| Orientation: | Access F Table 6d | | Area m² | | Fli Ta | ux ıble 6a | | g_ Table 6b | Т | FF able 6c | | Gains (W) | |
| Couthwoote | | | | | | | , , | | | | _ | . , | 1,-0 |
| Southwesto.s | | X | | | | 36.79 |] | 0.63 | X | 0.7 | = | 97.28 | (79) |
| Southwesto.s | 0 | X | | | | 62.67 | ļĻ | 0.63 | | 0.7 | _ = | 165.7 | [(79)] |
| | | X | | | | 85.75 | ļĻ | 0.63 | X | 0.7 | = | 226.72 |](79)] ₍₇₀₎ |
| Southweston | | X | 8.6 | | - | 106.25 | ļĻ | 0.63 | X | 0.7 | = | 280.91 | [(79) |
| Southwest _{0.9} | X 0.77 | X | 8.6 | 35 | X . | 119.01 | J L | 0.63 | X | 0.7 | = | 314.65 | (79) |

| Southw | est _{0.9x} | 0.77 | х | 8.6 | S5 | x | 1 | 18.15 | 1 [| 0.63 | x | 0.7 | = | 312.37 | (79) |
|----------|---------------------|-------------|-------------|------------|-------------|----------------|-----------------|-----------------|-----------------|-------------------|----------|--------------|----------|--------|-------|
| Southw | est _{0.9x} | 0.77 | x | 8.6 | 35 | x | 1 | 13.91 | i F | 0.63 | x | 0.7 | | 301.16 | (79) |
| Southw | est _{0.9x} | 0.77 | X | 8.6 | 35 | x | 1 | 04.39 | i F | 0.63 | x | 0.7 | = | 275.99 | (79) |
| Southw | est _{0.9x} | 0.77 | x | 8.6 | 35 | х | 9 | 92.85 | i F | 0.63 | x [| 0.7 | = | 245.49 | (79) |
| Southw | est _{0.9x} | 0.77 | x | 8.6 | 35 | х | 6 | 9.27 | i F | 0.63 | x [| 0.7 | = | 183.13 | (79) |
| Southw | est _{0.9x} | 0.77 | X | 8.6 | 35 | x | 4 | 14.07 | i F | 0.63 | x [| 0.7 | | 116.52 | (79) |
| Southw | est _{0.9x} | 0.77 | x | 8.6 | 35 | х | 3 | 31.49 | i F | 0.63 | x [| 0.7 | = | 83.25 | (79) |
| | _ | | | | | | | | _ | | | | | | |
| Solar (| gains in | watts, ca | alculate | d for eac | h month | 1 | | | (83)m = | Sum(74)m | (82)m | | | _ | |
| (83)m= | 97.28 | 165.7 | 226.72 | 280.91 | 314.65 | 31 | 12.37 | 301.16 | 275.99 | 245.49 | 183.13 | 116.52 | 83.25 | | (83) |
| Total g | gains – i | nternal a | and sola | r (84)m = | = (73)m | + (8 | 33)m | , watts | | | | | | , | |
| (84)m= | 650.35 | 714.42 | 755.82 | 779.93 | 783.22 | 75 | 53.63 | 726.48 | 709.47 | 696.32 | 664.26 | 631.16 | 622.9 | | (84) |
| 7. Me | an inter | nal temp | perature | (heating | seasor | n) | | | | | | | | | |
| Temp | erature | during h | neating p | oeriods ir | n the livi | ng a | area | from Tal | ble 9, T | h1 (°C) | | | | 21 | (85) |
| Utilisa | ation fac | tor for g | ains for | living are | ea, h1,m | า (ระ | ee Ta | ble 9a) | | | | | | | _ |
| | Jan | Feb | Mar | Apr | May | | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (86)m= | 0.89 | 0.86 | 0.81 | 0.74 | 0.63 | (|).48 | 0.36 | 0.38 | 0.55 | 0.74 | 0.85 | 0.9 | | (86) |
| Mean | interna | l temper | ature in | living are | ea T1 (f | ollo | w ste | ps 3 to 7 | 7 in Tal | ole 9c) | | | | | |
| (87)m= | 19.65 | 19.87 | 20.16 | 20.5 | 20.76 | 2 | 0.92 | 20.98 | 20.97 | 20.88 | 20.57 | 20.07 | 19.61 | | (87) |
| Temr | erature | durina h | neating i | eriods ir | rest of | dw | elling | from Ta | able 9. | Th2 (°C) | • | • | • | • | |
| (88)m= | 20.14 | 20.14 | 20.15 | 20.16 | 20.16 | т — | 0.17 | 20.17 | 20.17 | 20.17 | 20.16 | 20.15 | 20.15 |] | (88) |
| l Itilio | ation fac | tor for a | aine for | rest of d | wolling | h2 | m (se | no Tablo | (02) | | ! | Į | <u>!</u> | ı | |
| (89)m= | 0.88 | 0.85 | 0.79 | 0.71 | 0.59 | Т |).43 | 0.29 | 0.32 | 0.49 | 0.71 | 0.84 | 0.89 |] | (89) |
| | | | | ļ | <u> </u> | | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | 1 | | | , , |
| (90)m= | 18.36 | 18.67 | 19.08 | 19.55 | 19.9 | ΤŤ | 12 (T | 20.15 | 20.15 | 7 in Tab 20.05 | 19.65 | 18.97 | 18.31 | l | (90) |
| (90)111= | 10.50 | 10.07 | 19.00 | 19.55 | 19.9 | | -0.1 | 20.13 | 20.13 | | | ng area ÷ (4 | | 0.43 | (91) |
| | | | | | | | | | | | | | , | 0.40 | (0.7 |
| | | | | | | ~ ` | <u> </u> | | - ` | fLA) × T2 | | 10.45 | 10.07 | 1 | (02) |
| (92)m= | 18.92 | 19.18 | 19.55 | 19.96 | 20.27 | _ | 0.46 | 20.51 | 20.51 | 20.41 | 20.05 | 19.45 | 18.87 | | (92) |
| (93)m= | 18.92 | 19.18 | 19.55 | 19.96 | 20.27 | _ | 0.46 | 20.51 | 20.51 | nere appro | 20.05 | 19.45 | 18.87 | 1 | (93) |
| | | ting requ | | L | 20.27 | | 0.40 | 20.01 | 20.01 | 20.41 | 20.00 | 10.40 | 10.07 | | (33) |
| | | | | | re obtaiı | ned | at st | ep 11 of | Table | 9b, so tha | at Ti.m= | 76)m an | d re-cal | culate | |
| | | | | using Ta | | | | | | | | | | _ | |
| | Jan | Feb | Mar | Apr | May | | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| | ation fac | tor for g | ains, hn | າ: | ı | | | 1 | | | | | 1 | 1 | |
| (94)m= | 0.86 | 0.83 | 0.78 | 0.7 | 0.59 | (|).45 | 0.32 | 0.34 | 0.51 | 0.7 | 0.82 | 0.87 | | (94) |
| | | 1 | <u>`</u> | 4)m x (8 | | _ | | 1 | | | | _ | | 1 | (0.5) |
| (95)m= | 560.5 | 591.5 | 588.6 | 546.13 | 462.68 | | 35.83 | 232.13 | 242.04 | 354.24 | 465.33 | 516.62 | 543.4 | | (95) |
| | 4.3 | age exte | 1 | perature | | _ | | 16.6 | 16.4 | 144 | 10.6 | 7 1 | 1 42 | 1 | (96) |
| (96)m= | | | 6.5 | 8.9 | 11.7 | | ۱4.6 | 16.6 -[(30)m | 16.4 v [(03) | 14.1 n_ (96)m | 10.6 | 7.1 | 4.2 | J | (30) |
| (97)m= | 921.62 | 897.89 | 817.65 | 683.41 | 527.9 | _ | , vv = 55.52 | 237.37 | 248.57 | n- (96)m 385.3 | 582.02 | 765.08 | 914.37 | 1 | (97) |
| | | <u> </u> | <u> </u> | | <u> </u> | | | | <u> </u> | 7)m – (95 | L | | 1 | J | ζ= / |
| (98)m= | 268.68 | 205.89 | 170.41 | 98.84 | 48.52 | T | 0 | 0.02 | 0 | 0 | 86.81 | 178.89 | 276 |] | |
| • | | | | | <u> </u> | | | | | | | | | J | |

| | Total per year (kWh/year) = $Sum(98)_{15912}$ = | 1334.05 | (98) |
|---|--|---------------------|--------|
| Space heating requirement in kWh/m²/year | | 19.69 | (99) |
| 9b. Energy requirements – Community heating scheme | | | |
| This part is used for space heating, space cooling or water I Fraction of space heat from secondary/supplementary heating | | 0 | (301) |
| Fraction of space heat from community system $1 - (301) =$ | | 1 | (302) |
| The community scheme may obtain heat from several sources. The proceed | l dure allows for CHP and up to four other heat sources; th | he latter | |
| includes boilers, heat pumps, geothermal and waste heat from power static Fraction of heat from Community boilers | ons. See Appendix C. | 1 | (303a) |
| Fraction of total space heat from Community boilers | (302) x (303a) = | 1 | (304a) |
| Factor for control and charging method (Table 4c(3)) for cor | | 1 | (305) |
| Distribution loss factor (Table 12c) for community heating sy | , , , | 1.05 | (306) |
| Space heating | , | kWh/year | |
| Annual space heating requirement | | 1334.05 | 7 |
| Space heat from Community boilers | (98) x (304a) x (305) x (306) = | 1400.75 | (307a) |
| Efficiency of secondary/supplementary heating system in % | (from Table 4a or Appendix E) | 0 | (308 |
| Space heating requirement from secondary/supplementary | system (98) x (301) x 100 ÷ (308) = | 0 | (309) |
| Water heating | | | |
| Annual water heating requirement | | 2078.69 | |
| If DHW from community scheme: Water heat from Community boilers | (64) x (303a) x (305) x (306) = | 2182.63 | (310a) |
| Electricity used for heat distribution | 0.01 × [(307a)(307e) + (310a)(310e)] = | 35.83 | (313) |
| Cooling System Energy Efficiency Ratio | | 0 | (314) |
| Space cooling (if there is a fixed cooling system, if not enter | ~ 0) = (107) ÷ (314) = | 0 | (315) |
| Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input f | rom outside | 235.01 | (330a) |
| warm air heating system fans | | 0 | (330b) |
| pump for solar water heating | | 0 | (330g) |
| Total electricity for the above, kWh/year | =(330a) + (330b) + (330g) = | 235.01 | (331) |
| Energy for lighting (calculated in Appendix L) | | 330.87 | (332) |
| Electricity generated by PVs (Appendix M) (negative quantit | ty) | -683.38 | (333) |
| Electricity generated by wind turbine (Appendix M) (negative | e quantity) | 0 | (334) |
| 10b. Fuel costs – Community heating scheme | | | |
| Fuel kWh/ye | Fuel Price ear (Table 12) | Fuel Cost £/year | |
| Space heating from CHP (307a) | x 4.24 x 0.01 = | 59.39 | (340a) |
| Water heating from CHP (310a) | x 4.24 x 0.01 = | 92.54 | (342a) |

| | | Fu | iel Price | | |
|--|--|------------------------------|-------------------------------|----------------------|--------|
| Pumps and fans | (331) | | 13.19 × 0.01 = | 31 | (349) |
| Energy for lighting | (332) | | 13.19 x 0.01 = | 43.64 | (350) |
| Additional standing charges (Table 12) | | | | 120 | (351) |
| Energy saving/generation technologies | | | | | |
| Total energy cost | = (340a)(342e) + (345) | .(354) = | | 346.57 | (355) |
| 11b. SAP rating - Community heating | scheme | | | | |
| Energy cost deflator (Table 12) | | | | 0.42 | (356) |
| Energy cost factor (ECF) | $[(355) \times (356)] \div [(4) + 45.0]$ | 0] = | | 1.29 | (357) |
| SAP rating (section12) | | | | 81.99 | (358) |
| 12b. CO2 Emissions – Community hea | ting scheme | _ | | | |
| | | Energy kWh/year | Emission factor kg CO2/kWh | kg CO2/year | |
| CO2 from other sources of space and v | | | | | _ |
| Efficiency of heat source 1 (%) | If there is CHP us | ing two fuels repeat (363) t | to (366) for the second fu | uel 94 | (367a) |
| CO2 associated with heat source 1 | [(307b) |)+(310b)] x 100 ÷ (367b) x | 0.22 | 823.41 | (367) |
| Electrical energy for heat distribution | | [(313) x | 0.52 | = 18.6 | (372) |
| Total CO2 associated with community | systems | (363)(366) + (368)(3 | 72) | = 842.01 | (373) |
| CO2 associated with space heating (se | condary) | (309) x | 0 | = 0 | (374) |
| CO2 associated with water from immer | sion heater or instantar | neous heater (312) x | 0.22 | = 0 | (375) |
| Total CO2 associated with space and v | vater heating | (373) + (374) + (375) = | | 842.01 | (376) |
| CO2 associated with electricity for pum | ps and fans within dwe | lling (331)) x | 0.52 | 121.97 | (378) |
| CO2 associated with electricity for light | ing | (332))) x | 0.52 | = 171.72 | (379) |
| Energy saving/generation technologies Item 1 | (333) to (334) as appli | cable | 0.52 x 0.01 = | -354.67 | (380) |
| Total CO2, kg/year | sum of (376)(382) = | | 0.32 | 781.03 | (383) |
| Dwelling CO2 Emission Rate | (383) ÷ (4) = | | | 11.53 | (384) |
| El rating (section 14) | | | | 90.72 | (385) |
| 13b. Primary Energy – Community hea | ting scheme | | | | |
| | | Energy kWh/year | Primary factor | P.Energy kWh/year | |
| Energy from other sources of space an | d water heating (not Cl | _ | | you. | |
| Efficiency of heat source 1 (%) | If there is CHP us | ing two fuels repeat (363) t | to (366) for the second fu | uel 94 | (367a) |
| Energy associated with heat source 1 | [(307b) |)+(310b)] x 100 ÷ (367b) x | 1.22 | = 4650.77 | (367) |
| Electrical energy for heat distribution | | [(313) x | | = 110.01 | (372) |
| Total Energy associated with communi | ty systems | (363)(366) + (368)(3 | 72) | = 4760.78 | (373) |
| if it is negative set (373) to zero (unle | ess specified otherwise, | see C7 in Appendix | C) | 4760.78 | (373) |
| Energy associated with space heating | (secondary) | (309) x | 0 | = 0 | (374) |

| Energy associated with water from immersion heater or insta | ntaneous heater(312) x | 1.22 | = | 0 | (375) |
|--|-------------------------|------------|------|----------|-------|
| Total Energy associated with space and water heating | (373) + (374) + (375) = | | | 4760.78 | (376) |
| Energy associated with space cooling | (315) x | 3.07 | = | 0 | (377) |
| Energy associated with electricity for pumps and fans within | dwelling (331)) x | 3.07 | = | 721.49 | (378) |
| Energy associated with electricity for lighting | (332))) x | 3.07 | = | 1015.76 | (379) |
| Energy saving/generation technologies Item 1 | | 3.07 × 0.0 |)1 = | -2097.98 | (380) |
| Total Primary Energy, kWh/year sum of (37) | 6)(382) = | | | 4400.05 | (383) |

| | | l Iser I | Details: | | | | | | |
|---|--|--------------|-------------------------|--------------|-------------|----------|-----------|-----------------------|-------|
| Assessor Name: Software Name: | Zahid Ashraf Stroma FSAP 2012 | <u> </u> | Strom Softwa | | | | | 001082 on: 1.0.5.9 | |
| . | F | roperty | Address | Plot 2 | | | | | |
| Address: 1. Overall dwelling dime | ensions: | | | | | | | | |
| The Overall awalling all he | | Are | a(m²) | | Av. He | ight(m) | | Volume(m ³ | 3) |
| Ground floor | | | | (1a) x | 2 | 2.5 | (2a) = | 169.35 | (3a) |
| Total floor area TFA = (1 | a)+(1b)+(1c)+(1d)+(1e)+(1 | n) (| 67.74 | (4) | | | - | | _ |
| Dwelling volume | | | | (3a)+(3b |)+(3c)+(3c | d)+(3e)+ | .(3n) = | 169.35 | (5) |
| 2. Ventilation rate: | | | | | | | | | |
| | main seconda heating heating | ry | other | | total | | | m³ per hou | ır |
| Number of chimneys | 0 + 0 | + [| 0 | = [| 0 | X 4 | 40 = | 0 | (6a) |
| Number of open flues | 0 + 0 | - + - | 0 | Ī - [| 0 | x | 20 = | 0 | (6b) |
| Number of intermittent fa | ns | | | | 2 | x - | 10 = | 20 | (7a) |
| Number of passive vents | • | | | Ē | 0 | x - | 10 = | 0 | (7b) |
| Number of flueless gas fi | res | | | Ī | 0 | X 4 | 40 = | 0 | (7c) |
| | | | | L | | | | | |
| | | | | _ | | | Air ch | anges per ho | _ |
| | ys, flues and fans = $(6a)+(6b)+(6b)+(6a)$ seen carried out or is intended, process | | | continue fr | 20 | | ÷ (5) = | 0.12 | (8) |
| Number of storeys in the | | u 10 (11), | ouror wido (| orianao n | 0111 (0) 10 | (10) | | 0 | (9) |
| Additional infiltration | | | | | | [(9) | -1]x0.1 = | 0 | (10) |
| | .25 for steel or timber frame o | | | • | ruction | | | 0 | (11) |
| it both types of wall are pa deducting areas of openia | resent, use the value corresponding t ngs); if equal user 0.35 | o the grea | ter wall are | a (atter | | | | | |
| If suspended wooden t | floor, enter 0.2 (unsealed) or 0 | .1 (seal | ed), else | enter 0 | | | | 0 | (12) |
| If no draught lobby, en | • | | | | | | | 0 | (13) |
| - | s and doors draught stripped | | 0.05 10.0 | (4.4) 4 | 1001 | | | 0 | (14) |
| Window infiltration | | | 0.25 - [0.2] (8) + (10) | . , | - | ± (15) = | | 0 | (15) |
| Infiltration rate | q50, expressed in cubic metre | se nar h | | | | | area | 0 | (16) |
| • | lity value, then $(18) = [(17) \div 20] + (18)$ | • | • | • | cuc or c | invelope | arca | 0.37 | (17) |
| • | es if a pressurisation test has been do | | | | is being u | sed | | 0.01 | (:-0) |
| Number of sides sheltered | ed | | | | | | | 2 | (19) |
| Shelter factor | | | (20) = 1 - | | 19)] = | | | 0.85 | (20) |
| Infiltration rate incorporat | • | | (21) = (18 |) x (20) = | | | | 0.31 | (21) |
| Infiltration rate modified f | - 1 | 11 | | Can | | Nov | Daa | 1 | |
| Jan Feb | Mar Apr May Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly average wind sp (22)m= 5.1 5 | 4.9 4.4 4.3 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 | | |
| (-2)::- | 1.0 7.7 7.0 0.0 | L | 1 5.7 | | I 7.5 | I 7.5 | I 7./ | I | |
| Wind Factor (22a)m = (2 | | | 1 | | 1 | | 1 | 1 | |
| (22a)m= 1.27 1.25 | 1.23 1.1 1.08 0.95 | 0.95 | 0.92 | 1 | 1.08 | 1.12 | 1.18 | | |

| Adjusted infilti | ration rat | e (allowi | ng for sh | nelter an | d wind s | peed) = | (21a) x | (22a)m | | | | _ | |
|---------------------------------|-------------|--------------|-------------|--|--------------|-------------|--------------|-------------|-------------|----------------------|-----------|--------|------------|
| 0.4 | 0.39 | 0.38 | 0.34 | 0.34 | 0.3 | 0.3 | 0.29 | 0.31 | 0.34 | 0.35 | 0.37 | | |
| Calculate effe If mechanic | | _ | rate for t | ne appli | cable ca | se | | | | | | | (23 |
| If exhaust air h | | | endix N. (2 | (3b) = (23a | a) × Fmv (e | equation (I | N5)) . othe | rwise (23b | o) = (23a) | | | 0 | (23 |
| If balanced wit | | 0 | | , , | , | . , | ,, . | , | (200) | | | 0 | |
| a) If balance | | - | - | _ | | | | | Oh)m ı (| 22h) v [| 1 (220) | | (2: |
| 24a)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (2 |
| b) If balance | | | | | | | | | | | |] | • |
| 24b)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | (2 |
| c) If whole h | | | | | | | | | | | | J | ` |
| • | m < 0.5 > | | | • | • | | | | .5 × (23k | o) | | _ | |
| 24c)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (2 |
| d) If natural | ventilation | | | | • | | | | 0.51 | | | | |
| 24d)m= 0.58 | 0.58 | 0.57 | 0.56 | 0.56 | 0.54 | 0.54 | 0.54 | 0.55 | 0.56 | 0.56 | 0.57 | 1 | (2 |
| Effective air | change | | | L) or (24h | | c) or (24 | | (25) | ! | ! | ! | J | |
| 25)m= 0.58 | 0.58 | 0.57 | 0.56 | 0.56 | 0.54 | 0.54 | 0.54 | 0.55 | 0.56 | 0.56 | 0.57 | 1 | (2 |
| | | | | | | | l | | l | 1 | | J | |
| 3. Heat losse LEMENT | Gros | SS | Openin | gs | Net Ar | | U-valı | | AXU | | k-value | | AXk |
| 10.000 | area | (m²) | m | 14 | A ,r | | W/m2 | _ | (W/ | K) | kJ/m²- | K | kJ/K |
| oors | | | | | 2 | × | 1 | = | 2 | = | | | (2 |
| Vindows | | | | | 8.651 | x1 | /[1/(1.4)+ | 0.04] = | 11.47 | ᆜ . | | | (2 |
| loor | | | | | 67.73 | 9 x | 0.13 | = | 8.80606 | 9 | | _ | (2 |
| Valls Type1 | 50.9 | 99 | 8.65 | <u>. </u> | 42.34 | X | 0.18 | = | 7.62 | | | | (2 |
| Valls Type2 | 21.2 | 26 | 2 | | 19.26 | X | 0.18 | = | 3.47 | | | | (2 |
| Valls Type3 | 18.0 |)2 | 0 | | 18.02 | <u>x</u> | 0.18 | = | 3.24 | | | | (2 |
| Roof Type1 | 5.7 | , | 0 | | 5.7 | X | 0.13 | = | 0.74 | | | | (3 |
| Roof Type2 | 4.1 | 2 | 0 | | 4.12 | X | 0.13 | | 0.54 | | | | (3 |
| otal area of e | elements | , m² | | | 167.8 | 2 | | | | | | | (3 |
| for windows and | | | | | | ated using | g formula 1 | /[(1/U-valu | ue)+0.04] á | as given in | paragraph | 3.2 | |
| * include the are | | | | ls and par | titions | | (26)(30) | (22) – | | | | | |
| abric heat lo | | • | U) | | | | (20)(30) | | (20) . (2) | 0) . (00-) | (20-) | 37.88 | (3 |
| leat capacity | | | O | . T[A]: | . l. 1/ma21/ | | | ., , | (30) + (3 | , , , | (32e) = | 8654.2 | |
| hermal mass For design asses | • | • | | , | | | raciaaly the | | tive Value | | abla 1f | 250 | (3 |
| an be used inste | | | | CONSTRUCT | ion are not | kilowii pi | ecisely life | inuicative | values of | TIVIT III I | аые п | | |
| hermal bridg | es : S (L | x Y) cal | culated (| using Ap | pendix ł | < | | | | | | 12.71 | (3 |
| details of therm | al bridging | are not kn | own (36) = | = 0.05 x (3 | 1) | | | | | | | | |
| otal fabric he | eat loss | | | | | | | (33) + | (36) = | | | 50.59 | (3 |
| entilation he | at loss ca | i | l monthly | y | 1 | i | • | | = 0.33 × (| (25)m x (5) |) Ī | 1 | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| 38)m= 32.39 | 32.22 | 32.05 | 31.25 | 31.1 | 30.41 | 30.41 | 30.28 | 30.68 | 31.1 | 31.4 | 31.72 |] | (3 |
| leat transfer | coefficie | nt, W/K | | | | | | (39)m | = (37) + (| 38)m | | | |
| 39)m= 82.98 | 82.81 | 82.64 | 81.84 | 81.69 | 81 | 81 | 80.87 | 81.27 | 81.69 | 81.99 | 82.31 | | |
| troma FSAP 20 | 12 Version | : 1.0.5.9 (S | SAP 9.92) | - http://ww | w.stroma.c | com | | | Average = | Sum(39) ₁ | 12 /12= | 81.8≱ | age 2 of 3 |

| Heat loss para | meter (l | HP) W/ | m²K | | | | | (40)m | = (39)m ÷ | - (4) | | | |
|--|-------------|--------------|----------------|----------------|--------------------------|--------------|-------------|--------------|-------------|------------------------|----------|---------|------|
| (40)m= 1.22 | 1.22 | 1.22 | 1.21 | 1.21 | 1.2 | 1.2 | 1.19 | 1.2 | 1.21 | 1.21 | 1.22 | | |
| (13) | | | | | | | | | | Sum(40) ₁ . | | 1.21 | (40) |
| Number of day | s in mo | nth (Tab | le 1a) | | | | | | | (1) | | | `` |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (41)m= 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | | (41) |
| | | <u> </u> | | | <u> </u> | <u> </u> | | | | | | | |
| 4 | • | | | | | | | | | | 130/1./ | | |
| 4. Water heat | ing ene | rgy requi | rement: | | | | | | | | kWh/ye | ear: | |
| Assumed occur if TFA > 13.9 if TFA £ 13.9 | 9, N = 1 | | [1 - exp | (-0.0003 | 349 x (TF | FA -13.9 |)2)] + 0.0 | 0013 x (¯ | ΓFA -13. | | 19 | | (42) |
| Annual averag Reduce the annua | ıl average | hot water | usage by | 5% if the a | lwelling is | designed t | | | se target o | | .21 | | (43) |
| not more that 125 | litres per | person per | day (all w | ater use, l | hot and co | ld) | | | | | | | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Hot water usage in | n litres pe | r day for ea | ch month | Vd,m = fa | ctor from | Table 1c x | (43) | | | • | | | |
| (44)m= 94.83 | 91.39 | 87.94 | 84.49 | 81.04 | 77.59 | 77.59 | 81.04 | 84.49 | 87.94 | 91.39 | 94.83 | | |
| | | | | | | | | _ | Γotal = Su | m(44) ₁₁₂ = | | 1034.55 | (44) |
| Energy content of | hot water | used - cal | culated mo | onthly $= 4$. | 190 x Vd,r | m x nm x E | OTm / 3600 | kWh/mor | nth (see Ta | ables 1b, 1 | c, 1d) | | |
| (45)m= 140.64 | 123 | 126.93 | 110.66 | 106.18 | 91.62 | 84.9 | 97.43 | 98.59 | 114.9 | 125.42 | 136.2 | | |
| | | • | | | | • | | _ | Γotal = Su | m(45) ₁₁₂ = | | 1356.46 | (45) |
| If instantaneous w | ater heati | ng at point | of use (no | hot water | storage), | enter 0 in | boxes (46) |) to (61) | | | • | | |
| (46)m= 21.1 | 18.45 | 19.04 | 16.6 | 15.93 | 13.74 | 12.74 | 14.61 | 14.79 | 17.23 | 18.81 | 20.43 | | (46) |
| Water storage | | • | | | • | • | | | | | | | |
| Storage volum | e (litres |) includin | g any so | olar or W | /WHRS | storage | within sa | ame ves | sel | | 150 | | (47) |
| If community h | • | | | • | | | ` ' | | | | | | |
| Otherwise if no | | hot wate | er (this in | icludes i | nstantar | neous co | mbi boil | ers) ente | er '0' in (| 47) | | | |
| Water storage | | | | ! | (1-) (1/1 | . /-1 | | | | | | | (15) |
| a) If manufact | | | | or is kno | wn (kvvr | n/day): | | | | 1. | 39 | | (48) |
| Temperature fa | | | | | | | | | | 0. | 54 | | (49) |
| Energy lost fro | | _ | - | | | | (48) x (49) |) = | | 0. | 75 | | (50) |
| b) If manufactHot water stora | | | - | | | | | | | | | | (54) |
| If community h | - | | | C Z (KVVI | ii/iiti c /ua | iy <i>)</i> | | | | | 0 | | (51) |
| Volume factor | • | | 311 4.0 | | | | | | | | 0 | | (52) |
| Temperature fa | | | 2b | | | | | | | — | 0 | | (52) |
| Energy lost fro | | | | -ar | | | (47) x (51) |) x (52) x (| 53) = | | 0 | | (54) |
| Enter (50) or (| | _ | , 10 VIII/ y 0 | Jui | | | (, (0.) | , | , | - | 75 | | (55) |
| Water storage | , , | • | or each | month | | | ((56)m = (| 55) × (41): | m | 0. | | | () |
| | | | | | 00.50 | i | ,, , , | , , , | | 00.50 | 00.00 | | (EC) |
| (56)m= 23.33 | 21.07 | 23.33 | 22.58 | 23.33 | 22.58 | 23.33 | 23.33 | 22.58 | 23.33 | 22.58 | 23.33 | iv I I | (56) |
| If cylinder contains | dedicate | u solai sio | rage, (57) | 11 = (36)111 | x [(50) – (| п i i)] ÷ (э | o), eise (s | 7)111 = (56) | m where (| <u>г</u> | m Append | .х п | |
| (57)m= 23.33 | 21.07 | 23.33 | 22.58 | 23.33 | 22.58 | 23.33 | 23.33 | 22.58 | 23.33 | 22.58 | 23.33 | | (57) |
| Primary circuit | loss (ar | nnual) fro | m Table | 3 | | | | | | | 0 | | (58) |
| Primary circuit | loss ca | culated f | or each | month (| 59)m = (| (58) ÷ 36 | 65 × (41) | m | | <u> </u> | | | |
| (modified by | factor f | rom Tabl | le H5 if t | here is s | solar wat | er heatii | ng and a | cylinde | r thermo | stat) | | | |
| (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 loso d | a laulata d | for oach | month / | (64)m | (CO) + 20 | SE (41 | ١,,,, | | | | | | |
|---------------------------|----------------------|-------------|-------------|-----------|-----------|--------------|-------------|----------------|-------------|-------------------------|--------------|--------------------|---------------|
| Combi loss of (61) m= 0 | balculated 0 | or each | month (| 0 | (60) ÷ 3 | 05 × (41) | 0 | 0 | T 0 | 0 | 0 |] | (61) |
| | <u> </u> | | | <u> </u> | | | <u> </u> | <u> </u> | | | ļ | J (59)m + (61)m | (0.) |
| (62)m= 187.2 | | 173.52 | 155.75 | 152.77 | 136.72 | 131.5 | 144.02 | 143.68 | 161.49 | 170.51 | 182.79 | (59)111 + (61)111 | (62) |
| Solar DHW inpu | | | | <u> </u> | | <u> </u> | | 1 | | <u> </u> | | l | (02) |
| (add addition | | | | | | | | | ii contribu | ion to wat | or ricating) | | |
| (63)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| Output from | water hea | ter | | | | ! | ! | <u>ļ</u> | ļ. | ! | ! | 1 | |
| (64)m= 187.2 | _ | 173.52 | 155.75 | 152.77 | 136.72 | 131.5 | 144.02 | 143.68 | 161.49 | 170.51 | 182.79 | | |
| | Į. | | | | | | Out | put from w | ater heate | r (annual) ₁ | 112 | 1905.08 | (64) |
| Heat gains fi | rom water | heating, | kWh/m | onth 0.2 | 5 ´ [0.85 | × (45)m | ı + (61)r | n] + 0.8 : | x [(46)m | + (57)m | + (59)m | 1 | |
| (65)m= 84.04 | 4 74.57 | 79.48 | 72.87 | 72.58 | 66.54 | 65.51 | 69.67 | 68.85 | 75.48 | 77.78 | 82.56 | | (65) |
| include (5 | 7)m in cal | culation of | of (65)m | only if c | ylinder i | s in the | dwelling | or hot w | ater is f | rom com | munity h | neating | |
| 5. Internal | gains (see | e Table 5 | and 5a |): | | | - | | | | • | | |
| Metabolic ga | | | | | | | | | | | | | |
| Jan | | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | 1 | |
| (66)m= 109.5 | 5 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | 109.5 | | (66) |
| Lighting gair | ns (calcula | ted in Ap | pendix | L, equat | on L9 o | r L9a), a | lso see | Table 5 | • | • | • | 1 | |
| (67)m= 18.74 | 1 16.64 | 13.53 | 10.25 | 7.66 | 6.47 | 6.99 | 9.08 | 12.19 | 15.48 | 18.06 | 19.26 | | (67) |
| Appliances of | gains (calc | ulated in | Append | dix L, eq | uation L | 13 or L1 | 3a), als | see Ta | ble 5 | | | • | |
| (68)m= 191.9 | 6 193.96 | 188.94 | 178.25 | 164.76 | 152.08 | 143.61 | 141.62 | 146.64 | 157.33 | 170.82 | 183.49 | | (68) |
| Cooking gair | ns (calcula | ted in A | ppendix | L, equat | ion L15 | or L15a |), also s | ee Table | 5 | | • | • | |
| (69)m= 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | 33.95 | | (69) |
| Pumps and f | fans gains | (Table 5 | ōa) | | | | | | | | | • | |
| (70)m= 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | (70) |
| Losses e.g. | evaporatio | n (negat | tive valu | es) (Tab | le 5) | - | | | | | | | |
| (71)m= -87.6 | 87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | -87.6 | | (71) |
| Water heating | ng gains (T | able 5) | | - | | - | | - | | | | | |
| (72)m= 112.9 | 5 110.96 | 106.83 | 101.2 | 97.55 | 92.41 | 88.05 | 93.64 | 95.63 | 101.45 | 108.02 | 110.97 | | (72) |
| Total intern | al gains = | | | | (66) |)m + (67)m | n + (68)m | + (69)m + | (70)m + (7 | '1)m + (72) |)m | | |
| (73)m= 382.5 | 380.41 | 368.15 | 348.55 | 328.82 | 309.81 | 297.49 | 303.19 | 313.31 | 333.1 | 355.75 | 372.57 | | (73) |
| 6. Solar gai | | | | | | | | | | | | | |
| Solar gains ar | | _ | r flux from | Table 6a | | | ations to c | onvert to th | ne applical | | tion. | | |
| Orientation: | Access F Table 6d | | Area m² | | Flu | ıx ble 6a | _ | g_ rable 6b | т | FF able 6c | | Gains (W) | |
| 0 11 1 | | | | | | | , – | | , -, - | | | ` ' | 7 |
| Southwest _{0.9} | | X | 8.6 | 55 | x 3 | 36.79 | <u> </u> | 0.63 | x | 0.7 | = | 97.28 | <u> </u> (79) |
| Southwest _{0.9} | 0.77 | X | 8.6 | 55 | x (| 52.67 | <u> </u> | 0.63 | x | 0.7 | = | 165.7 | (79) |
| Southwest _{0.9} | 0.77 | X | 8.6 | | | 35.75 | ļ <u>Ļ</u> | 0.63 | x | 0.7 | = | 226.72 | <u> </u> (79) |
| Southwest _{0.9} | | X | 8.6 | 55 | x 1 | 06.25 | ļ <u>Ļ</u> | 0.63 | x | 0.7 | = | 280.91 | (79) |
| Southwest _{0.9} | 0.77 | X | 8.6 | 65 | x 1 | 19.01 | | 0.63 | X | 0.7 | = | 314.65 | (79) |

| Southwest _{0.9x} 0.77 | х | 8.6 | 55 | x | 118.15 | | | 0.63 | x | 0.7 | = | 312.37 | (79) |
|--------------------------------|-------------|--|-----------|---------------|--|---------|-----------------|----------------|------------|--------------|-----------|--------|-------|
| Southwest _{0.9x} 0.77 | х | 8.6 | 55 | x | 113.91 | | | 0.63 | x | 0.7 | = | 301.16 | (79) |
| Southwest _{0.9x} 0.77 | X | 8.6 | 55 | x | 104.39 | | | 0.63 | x | 0.7 | = | 275.99 | (79) |
| Southwest _{0.9x} 0.77 | X | 8.6 | 55 | x | 92.85 | | | 0.63 | x | 0.7 | = | 245.49 | (79) |
| Southwest _{0.9x} 0.77 | х | 8.6 | 55 | x | 69.27 | | | 0.63 | x | 0.7 | = | 183.13 | (79) |
| Southwest _{0.9x} 0.77 | х | 8.6 | 55 | x | 44.07 | | | 0.63 | x | 0.7 | = | 116.52 | (79) |
| Southwest _{0.9x} 0.77 | х | 8.6 | 55 | x | 31.49 | | | 0.63 | x | 0.7 | = | 83.25 | (79) |
| | | | | | | | | | | | | | |
| Solar gains in watts, c | alculated | for each | n month | | | (83 | 3)m = S | um(74)m . | (82)m | 1 | | ı | |
| (83)m= 97.28 165.7 | 226.72 | 280.91 | 314.65 | | 2.37 301. | | 275.99 | 245.49 | 183.13 | 116.52 | 83.25 | | (83) |
| Total gains – internal a | | ` | , , | · | | | | | | 1 | | 1 | |
| (84)m= 479.78 546.11 | 594.86 | 629.46 | 643.47 | 62 | 22.18 598. | 65 5 | 579.19 | 558.8 | 516.24 | 472.27 | 455.82 | | (84) |
| 7. Mean internal tem | oerature (| (heating | season |) | | | | | | | | | |
| Temperature during h | neating p | eriods ir | the livi | ng a | area from | Table | 9, Th | 1 (°C) | | | | 21 | (85) |
| Utilisation factor for g | ains for I | iving are | ea, h1,m | (se | ee Table 9 | a) | | | | | | ı | |
| Jan Feb | Mar | Apr | May | _ | Jun Ju | ıl | Aug | Sep | Oct | Nov | Dec | | |
| (86)m= 1 0.99 | 0.98 | 0.96 | 0.89 | 0 | 0.75 0.5 | 8 | 0.61 | 0.83 | 0.96 | 0.99 | 1 | | (86) |
| Mean internal temper | rature in I | iving are | ea T1 (fo | ollo | w steps 3 | to 7 ir | n Table | e 9c) | | | | | |
| (87)m= 19.76 19.92 | 20.16 | 20.47 | 20.74 | 20 | 0.93 20.9 | 98 2 | 20.98 | 20.87 | 20.52 | 20.08 | 19.73 | | (87) |
| Temperature during h | neating p | eriods ir | rest of | dwe | elling from | Tabl | le 9, Tl | h2 (°C) | | | | | |
| (88)m= 19.9 19.9 | 19.9 | 19.91 | 19.92 | 19 | 9.92 19.9 | 92 | 19.92 | 19.92 | 19.92 | 19.91 | 19.91 | | (88) |
| Utilisation factor for g | ains for r | est of d | wellina. | h2.ı | m (see Ta | ble 9a | a) | | | • | | ' | |
| (89)m= 0.99 0.99 | 0.98 | 0.94 | 0.85 | Г | 0.65 0.4 | | 0.48 | 0.75 | 0.95 | 0.99 | 1 | | (89) |
| Mean internal temper | rature in t | he rest | of dwelli | ina i | T2 (follow | stens | s 3 to 7 | 7 in Tahl | e 9c) | | | l | |
| (90)m= 18.26 18.49 | 18.85 | 19.29 | 19.66 | Ť | 9.87 19.9 | — i | 19.92 | 19.82 | 19.37 | 18.74 | 18.22 | | (90) |
| | | | | | | | | f | LA = Livir | ig area ÷ (4 | 1) = | 0.43 | (91) |
| Mean internal temper | rature (fo | r tha wh | ala dwa | lling | 7) — fl A 🗸 | T1 _ | /1 _ fl | ۸) پ T2 | | | | | |
| (92)m= 18.91 19.11 | 19.41 | 19.8 | 20.13 | - | $\begin{array}{c c} 0.33 & 20.3 \end{array}$ | | 20.37 | 20.27 | 19.86 | 19.32 | 18.87 | | (92) |
| Apply adjustment to t | | | | <u> </u> | | | | | | | | | , , |
| (93)m= 18.91 19.11 | 19.41 | 19.8 | 20.13 | 1 | 0.33 20.3 | | 20.37 | 20.27 | 19.86 | 19.32 | 18.87 | | (93) |
| 8. Space heating req | uirement | | | | , | | | | | | | | |
| Set Ti to the mean in | | | | ned | at step 11 | of Ta | able 9b | o, so tha | t Ti,m=(| 76)m an | d re-calc | ulate | |
| the utilisation factor for | | | | _ | | | _ | | | l | _ | 1 | |
| Jan Feb | Mar | Apr | May | _ ' | Jun Ju | | Aug | Sep | Oct | Nov | Dec | | |
| Utilisation factor for g | 0.97 | 0.94 | 0.86 | <u></u> ο | 0.69 0.5 | : | 0.54 | 0.78 | 0.94 | 0.99 | 0.99 | | (94) |
| Useful gains, hmGm | | | | | .09 0.0 | <u></u> | 0.54 | 0.70 | 0.34 | 0.99 | 0.99 | | (0.1) |
| (95)m= 476.31 538.6 | 578.33 | 589.89 | 550.47 | 42 | 9.52 300. | 15 | 313 | 436.68 | 487.35 | 465.55 | 453.19 | | (95) |
| Monthly average exte | | | | ı— able | <u> </u> e 8 | ! | | | | <u> </u> | | | |
| (96)m= 4.3 4.9 | 6.5 | 8.9 | 11.7 | $\overline{}$ | 4.6 16. | 6 | 16.4 | 14.1 | 10.6 | 7.1 | 4.2 | | (96) |
| Heat loss rate for me | an intern | al tempe | erature, | Lm | , W =[(39) | m x [| [(9 <u>3</u>)m | – (96)m |] | | | | |
| (97)m= 1212.14 1176.53 | 1067.11 | 891.91 | 688.44 | 46 | 3.89 305. | 95 3 | 321.35 | 501.38 | 756.67 | 1001.74 | 1207.7 | | (97) |
| Space heating requir | 1 1 | | | Wh/ | month = 0 | 0.024 | x [(97) |)m – (95 | | 1)m | | | |
| (98)m= 547.46 428.69 | 363.65 | 217.45 | 102.65 | | 0 0 | | 0 | 0 | 200.37 | 386.06 | 561.35 | | |

| | | | | | | Tota | l per year | (kWh/yea | r) = Sum(9 | 08)15,912 = | 2807.69 | (98) |
|--|----------------------------------|----------------------|-----------|-----------|---------------------|------------|---------------|-----------------------|------------------------|-------------|---------|----------|
| Space heating: Fraction of space heat from secondary/supplementary system | Space heating requirement i | n kWh/m ² | ²/year | | | | | | | ļ | 41.45 | (99) |
| Fraction of space heat from secondary/supplementary system | 9a. Energy requirements – In- | dividual h | eating s | ystems i | ncluding | micro-C | CHP) | | | | | |
| Fraction of space heat from main system (s) Fraction of total heating from main system 1 (204) = (202) × (1 - (203)) = | | | | | | | | | | ı | | - |
| Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) S47.46 28.68 363.55 217.45 102.65 0 0 0 0 200.37 386.06 561.35 | - | | | mentary | - | | (204) | | | | 0 | = ' |
| Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) [547.46 428.69 363.65 217.45 102.65 0 0 0 0 0 0 200.37 385.06 561.35 [211]m = [([99]m x (201])] × 100 ÷ (206) Space heating fuel (secondary), kWh/month = ([(198)m x (201])] × 100 ÷ (208) [215]m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | • | • | , , | | | ` ' | ` ' | (2.2.2) | | | 1 | ╡` ′ |
| Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec | _ | - | | | | (204) = (2 | 02) × [1 – | (203)] = | | | | ╡` ′ |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year | | 0, | | | 24 | | | | | | | ╡` ′ |
| Space heating requirement | | | · | g systen | Ո, % | ī | ī | · | • | | | ` |
| S47.46 | <u> </u> | | <u> </u> | L | Jul | Aug | Sep | Oct | Nov | Dec | kWh/ye | ∍ar |
| (211) m = {{((98)m x (204)}} } x 100 ÷ (206) | · | <u> </u> | T | | 0 | 0 | 0 | 200.37 | 386.06 | 561.35 | | |
| S85.52 458.49 388.93 232.57 109.79 0 0 0 0 214.3 412.9 600.38 Total (kWh/year) =Sum(211)_Lxa_Lx^2 3002.88 (211) | | | l | <u> </u> | | | | | | | | (211) |
| Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | | | 0 | 0 | 0 | 0 | 214.3 | 412.9 | 600.38 | | (=11) |
| ([98] m x (201)] x 100 ÷ (208) (215) (| l l | - | | ļ. | • | Tota | l (kWh/yea | ar) =Sum(2 | 211) _{15,101} | 2= | 3002.88 | (211) |
| Carry Carr | Space heating fuel (seconda | ıry), kWh | month/ | | | | | | | ' | | _ |
| Total (kWh/year) = Sum(215) Labal Laba | | | 1 | ı | | ı | ı | 1 | 1 | | | |
| Water heating Output from water heater (calculated above) [187,23] 165.09 173.52 155.75 152.77 136.72 131.5 144.02 143.68 161.49 170.51 182.79 [Efficiency of water heater | (215)m= 0 0 0 | 0 | 0 | 0 | 0 | | | | | | | 7(045) |
| Output from water heater (calculated above) [187.23 165.09 173.52 155.75 152.77 136.72 131.5 144.02 143.68 161.49 170.51 182.79 Efficiency of water heater | Water heating | | | | | TOLA | ii (KVVII/yea | ar) =Surri(2 | 213) _{15,101} | 2= | 0 | (215) |
| Efficiency of water heater | • | culated a | bove) | | | | | | | | | |
| (217) | | _ | 1 | 136.72 | 131.5 | 144.02 | 143.68 | 161.49 | 170.51 | 182.79 | | |
| Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = 213.95 189.22 200.04 181.73 182.35 171.32 164.78 180.48 180.05 189.12 196.15 208.63 Total = Sum(219a)_{1.12} = | Efficiency of water heater | | | | | | | | | | 79.8 | (216) |
| (219)m = (64)m x 100 ÷ (217)m (219)m = 213.95 189.22 200.04 181.73 182.35 171.32 164.78 180.48 180.05 189.12 196.15 208.63 Total = Sum(219a) ₁₋₁₂ = 2257.84 (219) Annual totals Space heating fuel used, main system 1 | (217)m= 87.51 87.25 86.74 | 85.7 | 83.78 | 79.8 | 79.8 | 79.8 | 79.8 | 85.39 | 86.93 | 87.61 | | (217) |
| 213.95 189.22 200.04 181.73 182.35 171.32 164.78 180.48 180.05 189.12 196.15 208.63 | • | | | | | | | | | | | |
| Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kWh/year Emission factor kg CO2/kWh kg CO2/kWh kg CO2/year | ` ' | | 182.35 | 171.32 | 164.78 | 180.48 | 180.05 | 189.12 | 196.15 | 208.63 | | |
| Space heating fuel used 3002.88 Water heating fuel used 2257.84 Electricity for pumps, fans and electric keep-hot central heating pump: 30 (230c) boiler with a fan-assisted flue 45 (230e) Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) Electricity for lighting 330.87 (232) 12a. CO2 emissions – Individual heating systems including micro-CHP Energy kWh/year kg CO2/kWh kg CO2/year | | ·! | | ! | | Tota | I = Sum(2 | 19a) ₁₁₂ = | ! | | 2257.84 | (219) |
| Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kWh/year Emission factor kg CO2/kWh kg CO2/kWh kg CO2/year | | | | | | | | k' | Wh/yea | r | | <u></u> |
| Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kg CO2/kWh Energy kg CO2/year | Space heating fuel used, mai | n system | 1 | | | | | | | | 3002.88 | ╛ |
| central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kg CO2/kWh Energy kg CO2/kWh | Water heating fuel used | | | | | | | | | | 2257.84 | |
| boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kg CO2/kWh kg CO2/year | Electricity for pumps, fans and | d electric | keep-ho | t | | | | | | | | |
| Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) Electricity for lighting 330.87 (232) 12a. CO2 emissions – Individual heating systems including micro-CHP Energy kWh/year Emission factor kg CO2/kWh kg CO2/year | central heating pump: | | | | | | | | | 30 | | (230c) |
| Electricity for lighting 12a. CO2 emissions – Individual heating systems including micro-CHP Energy Emission factor kg CO2/kWh Emissions kg CO2/year | boiler with a fan-assisted flu | Э | | | | | | | | 45 | | (230e) |
| 12a. CO2 emissions – Individual heating systems including micro-CHP Energy Emission factor kg CO2/kWh kg CO2/year | Total electricity for the above, | kWh/yea | ar | | | sum | of (230a). | (230g) = | : | | 75 | (231) |
| Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year | Electricity for lighting | | | | | | | | | | 330.87 | (232) |
| kWh/year kg CO2/kWh kg CO2/year | 12a. CO2 emissions – Indivi | dual heat | ing syste | ems inclu | uding mi | cro-CHF |) | | | | | |
| | | | | | | | | | | tor | | |
| | Space heating (main system | 1) | | | - | | | | | = [| | _ |

| Space heating (secondary) | (215) x | 0.519 | 0 (263) |
|---|---------------------------------|-----------------|---------------|
| Water heating | (219) x | 0.216 = | 487.69 (264) |
| Space and water heating | (261) + (262) + (263) + (264) = | | 1136.31 (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x | 0.519 = | 38.93 (267) |
| Electricity for lighting | (232) x | 0.519 = | 171.72 (268) |
| Total CO2, kg/year | sum | of (265)(271) = | 1346.96 (272) |
| | | | |

TER = 19.88 (273)