Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.41 *Printed on 09 June 2021 at 10:01:41* Project Information:

| Project informatio | JII. | | | |
|----------------------|--|---|-------------------------------|-------------------|
| Assessed By: | Ben Tunningley (| STRO027495) | Building Type: | Mid-terrace House |
| Dwelling Details: | | | | |
| NEW DWELLING | AS BUILT | | Total Floor Area: 7 | 4.1m ² |
| Site Reference : | Albany Farm | | Plot Reference: | Plot 031 |
| Address : | 11 Buttercup Roa | d , Bishops Waltham, SOUTH | IAMPTON , SO32 1RF | |
| Client Details: | | | | |
| Name: | Bargate Homes | | | |
| Address : | - | carage Farm Business Par, W | /inchester Road, Fair Oak, S | 6050 7HD |
| • | s items included w te report of regula | vithin the SAP calculations. tions compliance. | | |
| 1a TER and DEF | R | | | |
| Fuel for main heat | ing system: Mains g | as | | |
| Fuel factor: 1.00 (r | υ, | | | |
| • | xide Emission Rate | | 17.34 kg/m ² | |
| | Dioxide Emission Ra | te (DER) | 13.62 kg/m ² | OK |
| 1b TFEE and DF | | =) | $42 \in kM/b/m^2$ | |
| - | rgy Efficiency (TFEE nergy Efficiency (DF | | 43.6 kWh/m² 36.0 kWh/m² | |
| | lergy Enclericy (Di | | 30.0 KW1/11- | ОК |
| 2 Fabric U-value | es | | | |
| Element | | Average | Highest | |
| External | | 0.24 (max. 0.30) | 0.24 (max. 0.70) | OK |
| Party wal | I | 0.00 (max. 0.20) | - | ОК |
| Floor | | 0.11 (max. 0.25) | 0.11 (max. 0.70) | OK |
| Roof | | 0.11 (max. 0.20) | 0.11 (max. 0.35) | OK |
| Openings | 3 | 1.40 (max. 2.00) | 1.40 (max. 3.30) | OK |
| 2a Thermal brid | ging | | | |
| | | rom linear thermal transmittar | nces for each junction | |
| 3 Air permeabili | ty | | | |
| • | bility at 50 pascals | | 4.60 | |
| Maximum | | | 10.0 | OK |
| 4 Heating efficie | ency | | | |
| Main Heatir | ng system: | Database: (rev 478, produc | ct index 017929): | |
| | | Boiler systems with radiato Brand name: Ideal Model: LOGIC COMBI Model qualifier: ESP1 35 (Combi) Efficiency 89.6 % SEDBUK Minimum 88.0 % | rs or underfloor heating - ma | ains gas OK |
| Secondary | heating system: | None | | |

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| Cylinder insulation | | | |
|-------------------------------|------------------------|------------------|----|
| Hot water Storage: | No cylinder | | |
| Controls | | | |
| | | | |
| Space heating controls | Programmer, room therm | lostat and TRVs | OK |
| Hot water controls: | No cylinder thermostat | | |
| Boiler interlock: | No cylinder Yes | | ОК |
| Low energy lights | 163 | | OK |
| Percentage of fixed lights wi | th low-energy fittings | 100.0% | |
| Minimum | 0, 0 | 75.0% | ОК |
| Mechanical ventilation | | | |
| Continuous extract system (| decentralised) | | |
| Specific fan power: | | 0.16 0.18 | |
| Maximum | | 0.7 | OK |
| Summertime temperature | | | |
| Overheating risk (South Eng | land): | Slight | OK |
| sed on: | | | |
| Overshading: | | Very Little | |
| Windows facing: North West | | 3.06m² 6.51m² | |
| Windows facing: South East | | | |
| Ventilation rate: | | 4.00 No. 6 | |
| Blinds/curtains: | | None | |
|) Key features | | | |
| Roofs U-value | | 0.11 W/m²K | |
| Party Walls U-value | | 0 W/m²K | |
| Floors U-value | | 0.11 W/m²K | |
| Photovoltaic array | | | |

| | | | | | | User D | etails: | | | | | | |
|---------------------|----------------------------------|---------------------------------------|--------------------|-------------|-------------------|--------------|-----------------|-------------|-------------|----------|----------|-------------------------|--------------|
| Assesso Software | | | n Tunnir oma FS | 0, | | | Strom Softwa | are Ver | sion: | | | 027495 on: 1.0.5.41 | |
| | | 4.4 | D | Deed | | | Address | | | | - | | |
| Address : | dwelling di | | Buttercu | o Road , | , Bisnop | s vvaltna | am, 500 | THAMP | TON, S | 032 1RI | - | | |
| T. Overall | awening an | nension | 5. | | | Aro | a(m²) | | | ight(m) | | Volume(m ³) | |
| Ground floo |)r | | | | | | | (1a) x | | 2.4 | (2a) = | 88.92 | (3a) |
| | | | | | | | | | | |] | |] |
| First floor | | | | | | 3 | 37.05 | (1b) x | 2 | .67 | (2b) = | 98.92 | (3b) |
| Total floor a | area TFA = | (1a)+(1l | o)+(1c)+(| 1d)+(1e | e)+(1r | I) | 74.1 | (4) | | | | | |
| Dwelling vo | olume | | | | | (3a)+(3b) |)+(3c)+(3d | l)+(3e)+ | .(3n) = | 187.84 | (5) | | |
| 2. Ventilat | ion rate: | | | | | | | | | | | | |
| | | | main heating | | econdar eating | У | other | | total | | | m ³ per hour | |
| Number of | chimneys | Ĺ | 0 |] + [| 0 | + | 0 |] = [| 0 | x 4 | = 0 | 0 | (6a) |
| Number of | open flues | Ē | 0 | - - | 0 | | 0 |] = [| 0 | x 2 | 20 = | 0 |](6b) |
| Number of | intermittent | fans | | | | | | | 0 | x 1 | 0 = | 0 |](7a) |
| Number of | passive vei | nts | | | | | | | 0 | x 1 | 0 = | 0 |](7b) |
| Number of | flueless ga | s fires | | | | | | | 0 | x 4 | - 0 | 0 |] (7c) |
| | | | | | | | | L | | | | | J |
| | | | | | | | | | | | Air ch | anges per hou | ır |
| Infiltration o | | | | | | | | | 0 | | ÷ (5) = | 0 | (8) |
| | risation test ha | | | | ed, procee | d to (17), d | otherwise o | continue fr | om (9) to (| (16) | | | ٦ |
| | of storeys in al infiltration | | elling (ns | 5) | | | | | | [(0) | 11/0 1 | 0 | (9) |
| | l infiltration | | r staal or | timbor | frame or | 0 35 for | r masoni | w constr | uction | [(9)- | 1]x0.1 = | 0 | (10) (11) |
| if both ty | pes of wall ar | e present, | use the va | lue corres | | | | | uction | | | 0 |](11) |
| | ng areas of op Ided woode | 0 / . | | | ed) or 0. | 1 (seale | ed), else | enter 0 | | | | 0 | (12) |
| • | ught lobby, | | | | | (| ,, | | | | | 0 | (13) |
| Percenta | ge of windo | ows and | doors dr | aught st | ripped | | | | | | | 0 | (14) |
| Window | infiltration | | | - | | | 0.25 - [0.2 | x (14) ÷ 1 | = [00 | | | 0 | (15) |
| Infiltration | n rate | | | | | | (8) + (10) | + (11) + (1 | 2) + (13) + | + (15) = | | 0 | (16) |
| Air perme | eability valu | ie, q50, | expresse | d in cub | ic metre | s per ho | our per s | quare m | etre of e | nvelope | area | 4.5999999046325 | (17) |
| If based on | air permea | bility va | ue, then | (18) = [(1 | 7) ÷ 20]+(8 | 3), otherwi | ise (18) = (| (16) | | | | 0.23 | (18) |
| | bility value ap | | ressurisatio | on test has | s been dor | e or a deg | gree air pe | rmeability | is being us | sed | | | - |
| Number of | | ered | | | | | (20) = 1 - | [0 075 v (1 | 0)1 | | | 2 | (19) |
| Shelter fact | | ration al | | 4.0.7 | | | | | 9)] = | | | 0.85 | (20) |
| Infiltration r | | • | | | 1 | | (21) = (18 |) x (20) = | | | | 0.2 | (21) |
| Infiltration r | 1 | 1 | <u> </u> | | | 11 | Δ | 0.0 | | NI. | Det | 1 | |
| Ja | | Mar | Apr | Мау | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly av | | · · · · · · · · · · · · · · · · · · · | <u> </u> | | | | 1 | | | | | 1 | |
| (22)m= 5.1 | 1 5 | 4.9 | 4.4 | 4.3 | 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 | | |

| Wind Fa | actor (2 | 22a)m = | (22)m ÷ | 4 | | | | | | | | | | |
|----------|---------------|--------------------------------|----------------|-------------|--------------|-------------------------|----------------|----------------|-------------|----------------|------------|----------------|----------|----------------|
| (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 | | |
| Adjuste | d infiltr | ation rat | e (allowi | ing for sl | nelter an | d wind s | peed) = | (21a) x | (22a)m | | | | | |
| | 0.25 | 0.24 | 0.24 | 0.22 | 0.21 | 0.19 | 0.19 | 0.18 | 0.2 | 0.21 | 0.22 | 0.23 | | |
| | | <i>ctive air</i> al ventila | • | rate for t | he appli | cable ca | se | | | | | | 0.5 | (23a) |
| | | | | endix N. (2 | 3b) = (23a | a) × Fmv (e | equation (I | N5)) . othe | rwise (23b | (23a) = (23a) | | l | 0.5 | (23a) (23b) |
| | | | | | | or in-use fa | | | | () | | l | 0.5 0 | (230) (23c) |
| | | | - | - | - | | | | | 2h)m + (; | 23b) x [| l 1 – (23c) | - | (200) |
| (24a)m= | 0 | | | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | . 100] | (24a) |
| | alance | l d mecha | L anical ve | entilation | u without | heat rec | L coverv (N | I //V) (24b | m = (2) | 1 2b)m + (2 | 23b) | | | |
| (24b)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24b) |
| | | | | | • | ve input v | | | | Г (00h | \ | 11 | | |
| | (22b)n 0.5 | n < 0.5 × | r , | 0.5 | r i | 0); otnerv | 0.5 | ŕ | 0.5 m + 0 | .5 × (23b | , | 0.5 | l | (24c) |
| (24c)m= | | | 0.5 | | 0.5 | | | 0.5 | | 0.5 | 0.5 | 0.5 | | (240) |
| | | | | | | /e input v erwise (2 | | | | 0.5] | | | | |
| (24d)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24d) |
| Effect | ive air | change | rate - er | nter (24a |) or (24t | o) or (240 | c) or (24 | d) in boy | (25) | 1 | | | | |
| (25)m= | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | | (25) |
| 3 Hea | t lasse | s and he | at loss i | naramet | ≏r. | | • | • | • | • | | • | | |
| ELEM | | Gros | | Openin | | Net Ar | ea | U-valı | ue | AXU | | k-value | e AX | k |
| | | area | (m²) | 'n | | A ,n | n² | W/m2 | K | (W/ł | <) | kJ/m²∙ł | K kJ/ł | < |
| Doors | | | | | | 2.1 | x | 1.4 | = | 2.94 | | | | (26) |
| Window | s Type | e 1 | | | | 3.06 | x1 | /[1/(1.4)+ | 0.04] = | 4.06 | | | | (27) |
| Window | s Type | e 2 | | | | 6.51 | x1 | /[1/(1.4)+ | 0.04] = | 8.63 | | | | (27) |
| Floor | | | | | | 37.05 | 5 X | 0.11 | = | 4.0755 | \Box [| 75 | 2778.75 | (28) |
| Walls | | 44.6 | 6 | 11.6 | 7 | 32.99 |) x | 0.24 | = | 7.92 | | 60 | 1979.4 | (29) |
| Roof | | 37.0 |)5 | 0 | | 37.05 | 5 X | 0.11 | = | 4.08 | | 9 | 333.45 | (30) |
| Total ar | ea of e | elements | , m² | | | 118.70 | 6 | | | | | | | (31) |
| Party wa | all | | | | | 85.46 | 3 X | 0 | = | 0 | | 45 | 3845.7 | (32) |
| Internal | wall ** | | | | | 59.9 | | | | | [| 9 | 539.136 | (32c) |
| Internal | wall ** | | | | | 90.09 |) | | | |] | 9 | 810.7722 | (32c) |
| Internal | floor | | | | | 37.05 | 5 | | | | Ī | 18 | 666.9 | (32d) |
| Internal | ceiling | 1 | | | | 37.05 | 5 | | | | ĺ | 9 | 333.45 | (32e) |
| | | l roof winde as on both | | | | | ated using | formula 1 | /[(1/U-valu | ue)+0.04] a | s given in | n paragraph | 3.2 | _ |

| Fabric heat loss, $W/K = S (A \times U)$ | (26)(30) + (32) = | 31.7 | (33) |
|--|---------------------------------|----------|------|
| Heat capacity $Cm = S(A \times k)$ | ((28)(30) + (32) + (32a)(32e) = | 11287.56 | (34) |
| Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K | = (34) ÷ (4) = | 152.33 | (35) |

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

| can be ι | used inste | ad of a de | tailed calc | ulation. | | | | | | | | | | |
|------------|-------------|------------------------|-------------------|-------------|----------------|-------------|------------|---|-----------------------|------------------------|------------------------|---------|---------|--------------|
| Therm | al bridg | es : S (L | x Y) cal | culated | using Ap | pendix l | < | | | | | | 6.67 | (36) |
| if details | s of therma | al bridging | are not kn | own (36) = | = 0.05 x (3 | 1) | | | | | | | | |
| Total f | abric he | at loss | | | | | | | (33) + | (36) = | | | 38.37 | (37) |
| Ventila | ation hea | at loss ca | alculated | monthl | y | - | | | (38)m | = 0.33 × (| 25)m x (5) | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (38)m= | 30.99 | 30.99 | 30.99 | 30.99 | 30.99 | 30.99 | 30.99 | 30.99 | 30.99 | 30.99 | 30.99 | 30.99 |] | (38) |
| Heat ti | ransfer o | coefficie | nt, W/K | | | | | | (39)m | = (37) + (3 | 38)m | | | |
| (39)m= | 69.36 | 69.36 | 69.36 | 69.36 | 69.36 | 69.36 | 69.36 | 69.36 | 69.36 | 69.36 | 69.36 | 69.36 | | |
| Heat lo | oss para | ameter (H | · HLP), W/ | /m²K | | | | | | Average = = (39)m ÷ | Sum(39)₁. · (4) | 12 /12= | 69.36 | (39) |
| (40)m= | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |] | |
| Numbe | er of day | /s in mo | nth (Tab | le 1a) | | 1 | | | | Average = | Sum(40)1. | 12 /12= | 0.94 | (40) |
| - Turnov | 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 10/- | ten bee | (! | | | | | | | | | | | | |
| 4. 778 | ater nea | ting ene | rgy requ | irement: | | | | | | | | kWh/ye | ear: | |
| if TF | | | | [1 - exp | (-0.0003 | 849 x (TF | FA -13.9 |)2)] + 0.(| 0013 x (⁻ | TFA -13. | | 34 |] | (42) |
| Annua | l averag | e hot wa | | | | | | (25 x N) to achieve | | se target o | | .81 |] | (43) |
| | | - | person pe | | | - | - | | | jo larger e | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |] | |
| Hot wat | | | r day for ea | · · | , | | | - | 000 | ••• | | | 1 | |
| (44)m= | 98.79 | 95.2 | 91.6 | 88.01 | 84.42 | 80.83 | 80.83 | 84.42 | 88.01 | 91.6 | 95.2 | 98.79 |] | |
| | | | | | _ | | | _ | | | m(44) ₁₁₂ = | | 1077.7 | (44) |
| Energy | content of | ^t hot water | used - cal | culated mo | onthly $= 4$. | 190 x Vd,r | m x nm x D |))))))))))))))))))) | | | | | | |
| (45)m= | 146.5 | 128.13 | 132.22 | 115.27 | 110.61 | 95.45 | 88.44 | 101.49 | 102.7 | 119.69 | 130.65 | 141.88 | | |
| | | | | | | | | | | Total = Su | m(45) ₁₁₂ = | = | 1413.04 | (45) |
| lf instan | taneous v | vater heati | ng at point | of use (no | hot water | r storage), | enter 0 in | boxes (46 |) to (61) | - | | | | |
| (46)m= | 21.98 | 19.22 | 19.83 | 17.29 | 16.59 | 14.32 | 13.27 | 15.22 | 15.41 | 17.95 | 19.6 | 21.28 | | (46) |
| | storage | | | | | | | | | | | | 1 | |
| - | | . , | | | | | - | within sa | ame ves | sel | | 0 | | (47) |
| | | - | and no ta | | - | | | • • | | or (0) in (| 47) | | | |
| | storage | | not wate | er (this ir | iciudes i | nstantar | neous co | ombi boil | ers) ente | er 'O' in (| 47) | | | |
| | - | | eclared I | oss facto | or is kno | wn (kWł | n/dav). | | | | | 0 | 1 | (48) |
| | | | m Table | | | | "duy). | | | | | |] | (40) |
| - | | | r storage | | oor | | | (48) x (49) | _ | | | 0 |] | |
| b) If m | nanufact | turer's de | eclared o | cylinder l | oss fact | | known: | (40) X (49) | - | | | 0 |] | (50) |
| | | - | factor fr | | e 2 (kW | h/litre/da | ay) | | | | | 0 | J | (51) |
| | | ieating s from Ta | see secti | on 4.3 | | | | | | | | | 1 | |
| | | | bie ∠a m Table | 2b | | | | | | | | 0 0 | | (52) (53) |
| pc | | | | | | | | | | | | • | 1 | (00) |

| ••• | | m water (54) in (5 | - | , kWh/ye | ear | | | (47) x (51) | x (52) x (| 53) = | | 0 | | (54) (55) |
|---|--|---|--|---|---|---|---|--|---|--|---|---|---------------|--|
| Water s | storage | loss cal | culated f | or each | month | | | ((56)m = (| 55) × (41)ı | m | L | | I | |
| (56)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (56) |
| ` ´ | r contains | s dedicated | d solar sto | rage, (57)ı | m = (56)m | x [(50) – (| L H11)] ÷ (50 | 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 | v circuit | loss (an | nual) fro | om Table | | | | | | | | 0 | | (58) |
| | | loss cal | , | | | 59)m = (| (58) ÷ 36 | 5 × (41) | m | | | | | |
| (moc | lified by | factor fr | om Tab | le H5 if t | here is s | solar wat | er heatir | ng and a | cylinde | r thermo | stat) | | | |
| (59)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (59) |
| Combi | loss ca | lculated | for each | month (| (61)m = | (60) ÷ 36 | 65 × (41) | m | | | | | | |
| (61)m= | 13.76 | 12.43 | 13.76 | 13.31 | 13.76 | 13.31 | 13.76 | 13.76 | 13.31 | 13.76 | 13.31 | 13.76 | | (61) |
| Total h | eat requ | uired for | water he | eating ca | alculated | for eacl | h month | (62)m = | 0.85 × (| (45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= | 160.26 | 140.56 | 145.98 | 128.59 | 124.36 | 108.76 | 102.2 | 115.25 | 116.02 | 133.45 | 143.96 | 155.64 | | (62) |
| Solar DH | IW input o | calculated | using App | endix G or | Appendix | H (negati | ve quantity | v) (enter '0 | if no sola | r contributi | on to wate | er heating) | | |
| (add ad | dditiona | l lines if | FGHRS | and/or V | WWHRS | applies | , see Ap | pendix (| G) | - | | | | |
| (63)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| FHRS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) (G2) |
| Output | from wa | ater hea | ter | | | | | | | | | | | |
| (64)m= | 160.26 | 140.56 | 145.98 | 128.59 | 124.36 | 108.76 | 102.2 | 115.25 | 116.02 | 133.45 | 143.96 | 155.64 | | _ |
| | | | | | | | | Outp | out from wa | ater heatei | r (annual)₁ | 12 | 1575.01 | (64) |
| Heat ga | ains froi | m water | heating, | kWh/mo | onth 0.2 | 5 ´ [0.85 | × (45)m | + (61)m |] + 0.8 × | (46)m | + (57)m | + (59)m |] | |
| (65)m= | | | | | | | | | | | | | | |
| (/ | 52.15 | 45.71 | 47.4 | 41.66 | 40.22 | 35.06 | 32.85 | 37.18 | 37.48 | 43.24 | 46.77 | 50.61 | | (65) |
| | | 45.71 m in calc | | | | | | | | | | | eating | (65) |
| inclu | de (57)ı | | ulation o | of (65)m | only if c | | | | | | | | eating | (65) |
| inclu 5. Inte | de (57)ı ernal ga | m in calc ains (see | culation of Table 5 | of (65)m and 5a) | only if c | | | | | | | | eating | (65) |
| inclu 5. Inte | de (57)ı ernal ga | m in calc | culation of Table 5 | of (65)m and 5a) | only if c | | | | | | | | eating | (65) |
| inclu 5. Inte | de (57)i ernal ga blic gain | m in calc ains (see s (Table | culation of Table 5 | of (65)m and 5a) ts | only if c): | ylinder i | s in the c | dwelling | or hot w | ater is fr | om com | munity h | eating | (65) |
| inclu 5. Inte Metabo (66)m= | de (57)i ernal ga blic gain Jan 140.48 | m in calc ains (see s (Table Feb | culation of Table 5 5), Wat Mar 140.48 | of (65)m and 5a ts Apr 140.48 | only if c): May 140.48 | ylinder is Jun 140.48 | s in the c Jul 140.48 | dwelling Aug 140.48 | or hot w Sep 140.48 | ater is fr Oct | om com Nov | munity h Dec | eating | |
| inclu 5. Inte Metabo (66)m= | de (57)i ernal ga blic gain Jan 140.48 | m in calc ains (see s (Table Feb 140.48 | culation of Table 5 5), Wat Mar 140.48 | of (65)m and 5a ts Apr 140.48 | only if c): May 140.48 | ylinder is Jun 140.48 | s in the c Jul 140.48 | dwelling Aug 140.48 | or hot w Sep 140.48 | ater is fr Oct | om com Nov | munity h Dec | eating | |
| inclu 5. Inte Metaboo (66)m= Lighting (67)m= | de (57)i ernal ga blic gain Jan 140.48 g gains 48.32 | m in calc ains (see s (Table Feb 140.48 (calculat | Table 5 5), Wat Mar 140.48 ted in Ap 34.91 | of (65)m and 5a ts Apr 140.48 opendix 26.43 | only if c): May 140.48 L, equati 19.75 | Jun 140.48 ion L9 of 16.68 | Jul 140.48 r L9a), a 18.02 | Aug 140.48 Iso see 23.42 | or hot w Sep 140.48 Fable 5 31.44 | Oct 140.48 39.92 | om com Nov 140.48 | Dec | eating | (66) |
| inclu 5. Inte Metaboo (66)m= Lighting (67)m= | de (57)i ernal ga blic gain Jan 140.48 g gains 48.32 | m in calc ains (see s (Table Feb 140.48 (calculat 42.92 | Table 5 5), Wat Mar 140.48 ted in Ap 34.91 | of (65)m and 5a ts Apr 140.48 opendix 26.43 | only if c): May 140.48 L, equati 19.75 | Jun 140.48 ion L9 of 16.68 | Jul 140.48 r L9a), a 18.02 | Aug 140.48 Iso see 23.42 | or hot w Sep 140.48 Fable 5 31.44 | Oct 140.48 39.92 | om com Nov 140.48 | Dec | eating | (66) |
| inclu 5. Internet of the second secon | de (57)i ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 | m in calc ains (see s (Table Feb 140.48 (calculat 42.92 ins (calc | Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 | of (65)m and 5a ts Apr 140.48 opendix 26.43 Append 286.43 | only if c): 140.48 L, equati 19.75 dix L, eq 264.75 | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 | Jul 140.48 r L9a), a 18.02 13 or L1 230.77 | Aug 140.48 Iso see 23.42 3a), also 227.57 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 | ater is fr Oct 140.48 39.92 ble 5 252.8 | om com Nov 140.48 46.59 | Dec 140.48 49.67 | eating | (66) (67) |
| inclu 5. Internet of the second secon | de (57)i ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 | m in calc ains (see s (Table Feb 140.48 (calculat 42.92 ins (calc 311.67 | Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 | of (65)m and 5a ts Apr 140.48 opendix 26.43 Append 286.43 | only if c): 140.48 L, equati 19.75 dix L, eq 264.75 | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 | Jul 140.48 r L9a), a 18.02 13 or L1 230.77 | Aug 140.48 Iso see 23.42 3a), also 227.57 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 | ater is fr Oct 140.48 39.92 ble 5 252.8 | om com Nov 140.48 46.59 | Dec 140.48 49.67 | eating | (66) (67) |
| inclu 5. Int Metabo (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m= | de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 | m in calc ains (see s (Table Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula | culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 | of (65)m and 5a ts Apr 140.48 opendix 26.43 Append 286.43 opendix 51.39 | only if c): 140.48 L, equati 19.75 dix L, eq 264.75 L, equat | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 | Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a) | Aug 140.48 Iso see 23.42 3a), also 227.57 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table | ater is fr Oct 140.48 39.92 ble 5 252.8 5 | om com Nov 140.48 46.59 274.48 | munity h Dec 140.48 49.67 294.85 | eating | (66) (67) (68) |
| inclu 5. Int Metabo (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m= | de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 | m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 | culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 | of (65)m and 5a ts Apr 140.48 opendix 26.43 Append 286.43 opendix 51.39 | only if c): 140.48 L, equati 19.75 dix L, eq 264.75 L, equat | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 | Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a) | Aug 140.48 Iso see 23.42 3a), also 227.57 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table | ater is fr Oct 140.48 39.92 ble 5 252.8 5 | om com Nov 140.48 46.59 274.48 | munity h Dec 140.48 49.67 294.85 | eating | (66) (67) (68) |
| inclu 5. Int Metabo (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= | de (57) ernal ga Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3 | m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains | Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3 | of (65)m and 5a ts Apr 140.48 opendix 26.43 Appendix 286.43 opendix 51.39 5a) 3 | only if c): 140.48 L, equati 19.75 dix L, eq 264.75 L, equat 51.39 | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39 | Jul 140.48 r L9a), a 18.02 13 or L1: 230.77 or L15a) 51.39 | Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table 51.39 | ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39 | om com Nov 140.48 46.59 274.48 51.39 | Munity h | eating | (66) (67) (68) (69) |
| inclu 5. Int Metabo (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= | de (57) ernal ga Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3 | m in calo ains (see s (Table Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains 3 | Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3 | of (65)m and 5a ts Apr 140.48 opendix 26.43 Appendix 286.43 opendix 51.39 5a) 3 | only if c): 140.48 L, equati 19.75 dix L, eq 264.75 L, equat 51.39 | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39 | Jul 140.48 r L9a), a 18.02 13 or L1: 230.77 or L15a) 51.39 | Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table 51.39 | ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39 | om com Nov 140.48 46.59 274.48 51.39 | Munity h | eating | (66) (67) (68) (69) |
| inclu 5. Intr Metaboo (66)m= (66)m= [Lighting (67)m= (67)m= [Appliar (68)m= (69)m= [Pumps (70)m= Losses (71)m= | de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3 e.g. ev -93.66 | m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains 3 raporatio | Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3 n (negat -93.66 | of (65)m and 5a ts Apr 140.48 opendix 26.43 Appendix 286.43 opendix 51.39 5a) 3 tive valu | only if c): 140.48 L, equat 19.75 dix L, equat 264.75 L, equat 51.39 3 es) (Tab | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39 3 le 5) | Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a) 51.39 3 | Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39 3 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 se Table 51.39 3 | ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39 3 | om com Nov 140.48 46.59 274.48 51.39 3 | munity h Dec 140.48 49.67 294.85 51.39 3 | eating | (66) (67) (68) (69) (70) |
| inclu 5. International inclusion Metabox (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Lossess (71)m= Water I | de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3 e.g. ev -93.66 | m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains 3 raporatio -93.66 | Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3 n (negat -93.66 | of (65)m and 5a ts Apr 140.48 opendix 26.43 Appendix 286.43 opendix 51.39 5a) 3 tive valu | only if c): 140.48 L, equat 19.75 dix L, equat 264.75 L, equat 51.39 3 es) (Tab | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39 3 le 5) | Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a) 51.39 3 | Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39 3 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 se Table 51.39 3 | ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39 3 | om com Nov 140.48 46.59 274.48 51.39 3 | Munity h | eating | (66) (67) (68) (69) (70) |
| inclu 5. Intr Metabor (66)m= Lighting (67)m= Appliar (68)m= Cookin (69)m= Pumps (70)m= Lossess (71)m= Water I (72)m= | de (57) ernal ga blic gain Jan 140.48 g gains 48.32 nces ga 308.46 g gains 51.39 and far 3 e.g. ev -93.66 heating 70.1 | m in calc ains (see Feb 140.48 (calculat 42.92 ins (calc 311.67 (calcula 51.39 ns gains 3 raporatio -93.66 gains (T | Culation of Table 5 5), Wat Mar 140.48 ted in Ap 34.91 ulated in 303.6 ted in Ap 51.39 (Table 5 3 n (negat -93.66 fable 5) 63.71 | of (65)m and 5a ts Apr 140.48 opendix 26.43 opendix 286.43 opendix 51.39 5a) 3 tive valu -93.66 | only if c): 140.48 L, equati 19.75 Jix L, equati 264.75 L, equati 51.39 3 es) (Tab -93.66 | ylinder is Jun 140.48 ion L9 of 16.68 uation L 244.38 ion L15 51.39 3 le 5) -93.66 48.7 | Jul 140.48 r L9a), a 18.02 13 or L1 230.77 or L15a) 51.39 3 -93.66 | Aug 140.48 Iso see 23.42 3a), also 227.57 , also se 51.39 3 -93.66 49.98 | or hot w Sep 140.48 Table 5 31.44 see Tal 235.63 ee Table 51.39 3 -93.66 52.05 | ater is fr Oct 140.48 39.92 ble 5 252.8 5 51.39 3 -93.66 58.11 | om com Nov 140.48 46.59 274.48 51.39 3 -93.66 64.96 | munity h Dec 140.48 49.67 294.85 51.39 3 -93.66 68.03 | eating | (66) (67) (68) (69) (70) (71) |

6. Solar gains:

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

| - | e calculated using Access Facto Table 6d | | Area m² | Table 6a | a and | Flu | | ations | | g_ able 6b | е аррис | FF Table 6c | lion. | | Gains (W) | |
|----------------|--|---------|------------|----------|----------|---------|-----------|--------|-----------|--------------------|---------|----------------|-------|-----|--------------|------|
| Southeast 0.9x | 1 | x | 6.5 | 1 | x | 3 | 6.79 | x | | 0.45 | x | 1.11 | | = [| 107.79 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 6 | 2.67 | × | | 0.45 | x | 1.11 | | = [| 183.6 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 8 | 5.75 | x | | 0.45 | × | 1.11 | | = [| 251.21 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 10 | 06.25 | Īx | | 0.45 | × | 1.11 | | = [| 311.26 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 1 | 19.01 | × | | 0.45 | x | 1.11 | | = [| 348.64 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 1' | 18.15 | x | | 0.45 | × | 1.11 | | = [| 346.12 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 1 | 13.91 | x | | 0.45 | × | 1.11 | | = [| 333.7 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 10 | 04.39 | x | | 0.45 | × | 1.11 | | = [| 305.81 | (77) |
| Southeast 0.9x | 1 | x | 6.5 | 1 | x | 9 | 2.85 | x | | 0.45 | × | 1.11 | | = [| 272.01 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 6 | 9.27 | X | | 0.45 | × | 1.11 | | = [| 202.92 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 4 | 4.07 | x | | 0.45 | x | 1.11 | | = [| 129.1 | (77) |
| Southeast 0.9x | 1 | × | 6.5 | 1 | x | 3 | 1.49 | x | | 0.45 | × | 1.11 | | = [| 92.24 | (77) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 1 | 1.28 | × | | 0.45 | × | 1.11 | | = [| 15.54 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 2 | 2.97 | x | | 0.45 | x | 1.11 | | = [| 31.63 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 4 | 1.38 | x | | 0.45 | × | 1.11 | | = [| 56.98 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 6 | 7.96 | × | | 0.45 | × | 1.11 | | = [| 93.58 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 9 | 1.35 | x | | 0.45 | x | 1.11 | | = [| 125.78 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 9 | 7.38 |] x | | 0.45 | × | 1.11 | | = [| 134.1 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 9 | 91.1 |] × | | 0.45 | × | 1.11 | | = [| 125.45 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 7 | 2.63 | x | | 0.45 | × | 1.11 | | = [| 100.01 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 5 | 0.42 |] x | | 0.45 | × | 1.11 | | = [| 69.43 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 2 | 8.07 |] × | | 0.45 | × | 1.11 | | = [| 38.65 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 1 | 4.2 | x | | 0.45 | x | 1.11 | | = [| 19.55 | (81) |
| Northwest 0.9x | 1 | × | 3.0 | 6 | x | 9 | 9.21 |] × | | 0.45 | × | 1.11 | | = [| 12.69 | (81) |
| Color going i | | | for a cal | | L | | | (0.2)~ | | | | | | - | | |
| (83)m= 123.32 | n watts, calcu | 8.19 | 404.84 | 474.43 | 1 | 80.22 | 459.14 | 405 | | m(74)m . 341.44 | 241.5 | | 104.9 | 33 | | (83) |
| | internal and | | | | | | | | | - | | | | _ | | |
| (84)m= 651.43 | 3 739.05 81 | 1.63 | 876.77 | 914.2 | 8 | 91.19 | 853.3 | 808 | .01 | 761.78 | 693.6 | 2 635.9 | 618.7 | 7 | | (84) |
| 7. Mean inte | ernal tempera | ture (| heating | seaso | n) | | | | | | | | 1 | | | |
| | e during heat | ``` | Ŭ | | <i>.</i> | area f | rom Tal | ble 9 | , Th1 | (°C) | | | | Γ | 21 | (85) |
| • | actor for gains | • • | | | • | | | | | () | | | | L | | |
| Jan | - I - I | /lar | Apr | May | ТÌ. | Jun | Jul | A | ug | Sep | Oct | Nov | De | с | | |
| (86)m= 0.95 | 0.93 0. | .88 | 0.78 | 0.64 | 1 | 0.48 | 0.35 | 0.3 | 39 | 0.59 | 0.82 | 0.93 | 0.96 | ; | | (86) |
| Mean intern | al temperatur | e in li | ving are | ea T1 (| follo | w ste | os 3 to 7 | 7 in T | able | 9c) | | - | | | | |
| (87)m= 19.96 | | 0.43 | 20.7 | 20.89 | - | 20.97 | 20.99 | 20. | | 20.94 | 20.7 | 20.27 | 19.89 | 9 | | (87) |
| Temperatur | e during heat | ina ne | eriods in | resto | f dw | /ellina | from T: | able (| Э. Th | 2 (°C) | | | | | | |
| (88)m= 20.14 | <u> </u> | 0.14 | 20.14 | 20.14 | - | 20.14 | 20.14 | 20. | <u> </u> | 20.14 | 20.14 | 20.14 | 20.14 | 4 | | (88) |
| L | I | | | | | | | | | | | | I | | | |

| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ |
|---|
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ |
| $fLA = \text{Living area} \div (4) = 0.2 (91)$ Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ $(92)\text{m} = 19.35 19.55 19.81 20.07 20.23 20.3 20.31 20.31 20.27 20.07 19.66 19.29 (92)$ Apply adjustment to the mean internal temperature from Table 4e, where appropriate $(93)\text{m} = 19.2 19.4 19.66 19.92 20.08 20.15 20.16 20.16 20.12 19.92 19.51 19.14 (93)$ |
| Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.35 19.55 19.81 20.07 20.23 20.31 20.31 20.27 20.07 19.66 19.29 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.2 19.4 19.66 19.92 20.08 20.15 20.16 20.16 20.12 19.92 19.51 19.14 (93) |
| (92)m= 19.35 19.55 19.81 20.07 20.23 20.3 20.31 20.31 20.27 20.07 19.66 19.29 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.2 19.4 19.66 19.92 20.08 20.15 20.16 20.16 20.12 19.92 19.51 19.14 (93) |
| (92)m= 19.35 19.55 19.81 20.07 20.23 20.3 20.31 20.31 20.27 20.07 19.66 19.29 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.2 19.4 19.66 19.92 20.08 20.15 20.16 20.16 20.12 19.92 19.51 19.14 (93) |
| (93)m= 19.2 19.4 19.66 19.92 20.08 20.15 20.16 20.16 20.12 19.92 19.51 19.14 (93) |
| |
| 8 Space beating requirement |
| o. Space neating requirement |
| Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate |
| the utilisation factor for gains using Table 9a |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec |
| Utilisation factor for gains, hm: (94)m= 0.94 0.9 0.84 0.74 0.59 0.42 0.29 0.32 0.53 0.77 0.9 0.95 (94) |
| Useful gains, hmGm , W = (94) m x (84) m |
| (95)m= 609.55 666.75 685.48 650.6 542.92 377.08 245.75 258.83 400 534.96 572.85 584.69 (95) |
| Monthly average external temperature from Table 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 rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m] |
| (97)m= 1033.82 1005.91 912.73 764.06 581.26 384.7 246.96 260.72 417.81 646.22 861.06 1036.33 (97) |
| Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m |
| (98)m= 315.66 227.91 169.08 81.69 28.53 0 0 0 0 82.78 207.51 336.02 |
| Total per year (kWh/year) = Sum(98) _{15,912} = 1449.18 (98) |
| Space heating requirement in kWh/m²/year 19.56 (99) |
| 9a. Energy requirements – Individual heating systems including micro-CHP) |
| Space heating: |
| Fraction of space heat from secondary/supplementary system 0 (201) |
| Fraction of space heat from main system(s) $(202) = 1 - (201) =$ 1(202) |
| Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1(204) |
| Efficiency of main space heating system 1 90.5 (206) |
| Efficiency of secondary/supplementary heating system, % |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year |
| Space heating requirement (calculated above) |
| 315.66 227.91 169.08 81.69 28.53 0 0 0 0 82.78 207.51 336.02 |
| $(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (211) |
| 348.79 251.84 186.83 90.26 31.52 0 0 0 91.47 229.29 371.3 |
| Total (kWh/year) =Sum(211) _{15,1012} = 1601.3 (211) |
| Space heating fuel (secondary), kWh/month |
| $= \{ [(98)m \times (201)] \} \times 100 \div (208)$ |
| (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| Total (kWh/year) =Sum(215) ₁₅₁₀₁₂ = 0 (215) |

Water heating

| Output | t from wa | ater heat | ter (calc | ulated at | oove) | | | | | | | | | |
|---|---|--|---|---|------------------------------|--|---|-----------------|------------|---|---|---|--|---|
| | 160.26 | 140.56 | 145.98 | 128.59 | 124.36 | 108.76 | 102.2 | 115.25 | 116.02 | 133.45 | 143.96 | 155.64 | | _ |
| | ncy of wa | | | | | | | | | | | | 87.3 | (216) |
| (217)m= | | 89.25 | 88.99 | 88.52 | 87.88 | 87.3 | 87.3 | 87.3 | 87.3 | 88.5 | 89.16 | 89.46 | | (217) |
| | or water I n = (64)r | - | | | | | | | | | | | | |
| . , | 179.27 | 157.48 | 164.04 | 145.27 | 141.52 | 124.58 | 117.07 | 132.01 | 132.89 | 150.79 | 161.47 | 173.97 |] | |
| | | | | | | | | Tota | l = Sum(2 | 19a) ₁₁₂ = | | - | 1780.35 | (219) |
| | al totals | fuelues | d modia | o | 4 | | | | | k' | Wh/year | r | kWh/year | 7 |
| • | • | | | system | 1 | | | | | | | | 1601.3 | |
| | heating | | | | | | | | | | | | 1780.35 | |
| Electric | city for p | umps, fa | ans and | electric l | keep-ho | t | | | | | | | _ | |
| mech | anical ve | entilatior | n - balan | iced, ext | ract or p | ositive ir | nput fror | n outside | Э | | | 49.6 |] | (230a) |
| centra | al heatin | g pump: | | | | | | | | | | 30 |] | (230c) |
| boiler | with a fa | an-assis | ted flue | | | | | | | | | 45 | | (230e) |
| Total e | electricity | for the | above, ł | (Wh/yea | r | | | sum | of (230a). | (230g) = | | | 124.6 | (231) |
| Electric | city for lig | ghting | | | | | | | | | | | 341.37 | (232) |
| Electric | city gene | erated by | y PVs | | | | | | | | | | -240.96 | (233) |
| Total d | lelivered | energy | for all us | ses (211 |)(221) | + (231) | + (232) | (237b) | = | | | | 3606.67 | (338) |
| 10a. I | Fuel cos | ts - indiv | vidual he | eating sy | stems: | | | | | | | | | |
| | | | | | | | | | | | _ | | | |
| | | | | | | Fu kW | el /h/year | | | Fuel P (Table | | | Fuel Cost £/year | |
| Space | heating | - main s | system 1 | | | kW | - | | | | 12) | x 0.01 = | | (240) |
| | heating heating | | | | | kW (211 | /h/year | | | (Table | 12) ¹⁸ | x 0.01 = x 0.01 = | £/year |](240)](241) |
| Space | - | - main s | system 2 | | | kW (211 (213 | /h/year 1) x | | | (Table | 12) ¹⁸ | | £/year 55.73 | |
| Space Space | heating | - main s - secon | system 2 dary | | | kW (211 (213 | /h/year 1) x 3) x 5) x | | | (Table 3.4 | 12) ¹⁸ 19 | x 0.01 = | £/year 55.73 0 | (241) |
| Space Space Water | heating heating | - main s - secone cost (oth | system 2 dary her fuel) | 2 | | kW (211 (213 (215 | /h/year 1) x 3) x 5) x 9) | | | (Table 3.4 0 13. | 12) 18 19 18 | x 0.01 = x 0.01 = | £/year 55.73 0 |](241)](242) |
| Space Space Water Pumps (if off-p | heating heating heating s, fans ar beak tarif | - main s - secone cost (oth nd electi ff, list ea | system 2 dary ner fuel) ric keep- | 2 -hot | 230g) se | kW (211 (213 (215 (215 (234 (234 | /h/year 1) x 3) x 5) x 9) 1) / as app | licable a | nd apply | (Table 3.4 0 13. 3.4 13. / fuel prin | 12) 18 19 19 19 19 ce accor | $\begin{array}{l} x \ 0.01 = \\ \end{array}$ | £/year 55.73 0 0 61.96 16.43 Table 12a |](241)](242)](247)](249) |
| Space Space Water Pumps (if off-p Energy | heating heating heating s, fans ar beak tarif y for light | - main s - secone cost (oth nd electu ff, list ea ting | dary dary ner fuel) ric keep- ch of (23 | 2 -hot 30a) to (2 | 230g) se | kW (211 (213 (215 (215) (231 | /h/year 1) x 3) x 5) x 9) 1) / as app | licable a | nd apply | (Table 3.4 0 13. 3.4 13. | 12) 18 19 19 19 19 ce accor | x 0.01 = x 0.01 = x 0.01 = x 0.01 = | £/year 55.73 0 0 61.96 16.43 | (241) (242) (247) (249) (250) |
| Space Space Water Pumps (if off-p Energy | heating heating heating s, fans ar beak tarif | - main s - secone cost (oth nd electu ff, list ea ting | dary dary ner fuel) ric keep- ch of (23 | 2 -hot 30a) to (2 | 230g) se | kW (211 (213 (215 (215 (234 (234 | /h/year 1) x 3) x 5) x 9) 1) / as app | licable a | nd apply | (Table 3.4 0 13. 3.4 13. 7 fuel prin | 12) 18 19 19 19 19 ce accor | $\begin{array}{l} x \ 0.01 = \\ \end{array}$ | £/year 55.73 0 0 61.96 16.43 Table 12a |](241)](242)](247)](249) |
| Space Space Water Pumps (if off-p Energy | heating heating heating s, fans ar beak tarif y for light | - main s - secone cost (oth nd electu ff, list ea ting | dary dary ner fuel) ric keep- ch of (23 | 2 -hot 30a) to (2 | 230g) se | kW (211 (213 (215 (215 (237 eparately (237 | /h/year 1) x 3) x 5) x 9) 1) / as app | | nd apply | (Table 3.4 0 13. 3.4 13. 7 fuel prin | 12) 18 19 18 19 19 19 ce accor 19 | $\begin{array}{l} x \ 0.01 = \\ \end{array}$ | £/year 55.73 0 0 61.96 16.43 Table 12a 45.03 | (241) (242) (247) (249) (250) |
| Space Space Water Pumps (if off-p Energy Additio | heating heating heating s, fans ar beak tarif y for light onal stan | - main s - secone cost (oth nd electr ff, list ea ting ding cha | dary her fuel) ric keep- ch of (23 arges (Ta | 2 -hot 30a) to (2 | | kW (211 (213 (215 (215 (232 eparately (232 one | <pre>/h/year 1) x 3) x 5) x 9) 1) / as app of (233) to</pre> | | nd apply | (Table 3.4 0 13. 3.4 13. 7 13. 7 13. | 12) 18 19 18 19 19 19 ce accor 19 | $\begin{array}{l} x \ 0.01 = \\ \hline \begin{array}{l} x \ 0.01 = \\ x \ 0.01 = \end{array}$ | £/year 55.73 0 0 61.96 16.43 Table 12a 45.03 120 | (241) (242) (247) (249) (250) (250) |
| Space Space Water Pumps (if off-p Energy Additio | heating heating heating s, fans ar beak tarif y for light onal stan | - main s - second cost (oth nd electu ff, list ea ting ding cha | dary dary ner fuel) ric keep- ch of (23 arges (Tr eat lines | 2 -hot 30a) to (able 12) | nd (254) | kW (21) (21) (21) (21) (23) eparately (23) one as need | <pre>/h/year 1) x 3) x 5) x 9) 1) / as app of (233) to</pre> | o (235) x) | nd apply | (Table 3.4 0 13. 3.4 13. 7 13. 7 13. | 12) 18 19 18 19 19 19 ce accor 19 | $\begin{array}{l} x \ 0.01 = \\ \hline \begin{array}{l} x \ 0.01 = \\ x \ 0.01 = \end{array}$ | £/year 55.73 0 0 61.96 16.43 Table 12a 45.03 120 | (241) (242) (247) (249) (250) (250) |
| Space Space Water Pumps (if off-p Energ) Additio Additio | heating heating heating s, fans an beak tarif y for light onal stan dix Q ite energ | - main s - second cost (oth nd electr ff, list ea ting ding cha ms: repe y cost | dary dary ner fuel) ric keep- ch of (23 arges (Ta eat lines | 2 -hot 30a) to (able 12) | nd (254) (245)(| kW (21) (21) (21) (21) (23) eparately (23) one as need | /h/year 1) x 3) x 5) x 9) 1) / as app of (233) to ded | o (235) x) | nd apply | (Table 3.4 0 13. 3.4 13. 7 13. 7 13. | 12) 18 19 18 19 19 19 ce accor 19 | $\begin{array}{l} x \ 0.01 = \\ \hline \begin{array}{l} x \ 0.01 = \\ x \ 0.01 = \end{array}$ | £/year 55.73 0 0 61.96 16.43 Table 12a 45.03 120 -31.78 | (241) (242) (247) (249) (250) (251) (252) |
| Space Space Water Pumps (if off-p Energy Additio Additio Appen Total | heating heating heating s, fans an beak tarif y for light onal stan dix Q ite energ | - main s - second cost (oth nd electu ff, list ea ting ding cha ms: repe y cost ng - indir | dary dary ner fuel) ric keep- ch of (23 arges (Tr eat lines vidual he | -hot 30a) to (: able 12) (253) ar eating sy | nd (254) (245)(| kW (21) (21) (21) (21) (23) eparately (23) one as need | /h/year 1) x 3) x 5) x 9) 1) / as app of (233) to ded | o (235) x) | nd apply | (Table 3.4 0 13. 3.4 13. 7 13. 7 13. | 12) 18 19 18 19 19 19 ce accor 19 | $\begin{array}{l} x \ 0.01 = \\ \hline \begin{array}{l} x \ 0.01 = \\ x \ 0.01 = \end{array}$ | £/year 55.73 0 0 61.96 16.43 Table 12a 45.03 120 -31.78 | (241) (242) (247) (249) (250) (251) (252) |
| Space Space Water Pumps (if off-p Energy Additio Appen Total 11a. S Energy | heating heating heating s, fans an beak tarif y for light onal stan dix Q ite energ SAP ratin | - main s - second cost (oth nd electu ff, list ea ting ding cha ms: repe y cost ng - indiv | dary dary ner fuel) ric keep- ch of (2: arges (T arges (T eat lines vidual he | -hot 30a) to (: able 12) (253) ar eating sy | nd (254) (245)(rstems | kW (211 (213 (214 (214 (214 (214 (214 (214 (214) | /h/year 1) x 3) x 5) x 9) 1) / as app of (233) to ded | o (235) x) = | nd apply | (Table 3.4 0 13. 3.4 13. 7 13. 7 13. | 12) 18 19 18 19 19 19 ce accor 19 | $\begin{array}{l} x \ 0.01 = \\ \hline \begin{array}{l} x \ 0.01 = \\ x \ 0.01 = \end{array}$ | £/year 55.73 0 0 61.96 16.43 Table 12a 45.03 120 -31.78 267.36 | (241) (242) (247) (249) (250) (250) (251) (252) (255) |

| 12a. CO2 emissions – Individual heating systems | s including micro-CHP | | |
|---|---|---|---|
| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
| Space heating (main system 1) | (211) x | 0.216 = | 345.88 (261) |
| Space heating (secondary) | (215) x | 0.519 = | 0 (263) |
| Water heating | (219) x | 0.216 = | 384.56 (264) |
| Space and water heating | (261) + (262) + (263) + (| 264) = | 730.44 (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x | 0.519 = | 64.67 (267) |
| Electricity for lighting | (232) x | 0.519 = | 177.17 (268) |
| Energy saving/generation technologies Item 1 | | 0.519 = | -125.06 (269) |
| Total CO2, kg/year | | sum of (265)(271) = | 847.22 (272) |
| CO2 emissions per m ² | | (272) ÷ (4) = | 11.43 (273) |
| EI rating (section 14) | | | 90 (274) |
| 13a. Primary Energy | | | |
| roa. r hinary Energy | | | |
| Tou. T finary Enorgy | Energy kWh/year | Primary factor | P. Energy kWh/year |
| Space heating (main system 1) | | • | |
| | kWh/year | factor | kWh/year |
| Space heating (main system 1) | kWh/year (211) x | factor = | kWh/year 1953.59 (261) |
| Space heating (main system 1) Space heating (secondary) | kWh/year (211) x (215) x | factor = 1.22 = 3.07 = 1.22 = | kWh/year 1953.59 (261) 0 (263) |
| Space heating (main system 1) Space heating (secondary) Energy for water heating | kWh/year (211) x (215) x (219) x | factor = 1.22 = 3.07 = 1.22 = | kWh/year 1953.59 (261) 0 (263) 2172.03 (264) |
| Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating | kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (| factor = 1.22 = 3.07 = 1.22 = 264) = | kWh/year 1953.59 (261) 0 (263) 2172.03 (264) 4125.62 (265) |
| Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot | kWh/year (211) x (215) x (219) x (261) + (262) + (263) + ((231) x | factor = 1.22 = 3.07 = 1.22 = 264) = 3.07 = | kWh/year 1953.59 (261) 0 (263) 2172.03 (264) 4125.62 (265) 382.52 (267) |
| Space heating (main system 1) Space heating (secondary) Energy for water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies | kWh/year (211) x (215) x (219) x (261) + (262) + (263) + ((231) x | factor 1.22 = 3.07 = 1.22 = 264) = 3.07 = 0 = | kWh/year 1953.59 (261) 0 (263) 2172.03 (264) 4125.62 (265) 382.52 (267) 1048.01 (268) |

| | | | | | User D | Details: | | | | | | |
|--|-------------|--------------------|-------------|--------------------|------------|---------------------------|-----------------------|-------------|----------|----------|-------------------------|------|
| Assessor Name: Software Name: | | n Tunnir oma FS | ••• | | | Softwa | a Num are Ver | rsion: | | | 027495 on: 1.0.5.41 | |
| | | | | | | Address | | | | | | |
| Address : | | Buttercu | p Road , | , Bishops | s Waltha | am, SOU | ITHAMP | TON , S | 032 1RI | F | | |
| 1. Overall dwelling d | imension | IS: | | | _ | | | | | | | |
| One word file on | | | | | | a(m²) | | | ight(m) | 1 | Volume(m ³) | ٦ |
| Ground floor | | | | | 3 | 37.05 | (1a) x | 2 | 2.4 | (2a) = | 88.92 | (3a) |
| First floor | | | | | 3 | 37.05 | (1b) x | 2 | .67 | (2b) = | 98.92 | (3b) |
| Total floor area TFA = | : (1a)+(1 | b)+(1c)+(| (1d)+(1e | e)+(1r |) | 74.1 | (4) | | | | | |
| Dwelling volume | | | | | | | (3a)+(3b) |)+(3c)+(3d | d)+(3e)+ | .(3n) = | 187.84 | (5) |
| 2. Ventilation rate: | | | | | | | | | | | | |
| | | main heating | | econdar leating | у | other | | total | | | m ³ per hour | |
| Number of chimneys | Г | 0 | <u></u> ד ר | 0 |] + [| 0 | = | 0 | x 4 | 40 = | 0 | (6a) |
| Number of open flues | Ē | 0 | - + | 0 | - + | 0 | ī - Г | 0 | x 2 | 20 = | 0 | (6b) |
| Number of intermitten | t fans | | | | | | | 0 | x 1 | 0 = | 0 | (7a) |
| Number of passive ve | nts | | | | | | Г | 0 | x 1 | 0 = | 0 | (7b) |
| Number of flueless ga | s fires | | | | | | Ē | 0 | x 4 | 40 = | 0 | (7c) |
| | | | | | | | L | | | | | 1 |
| | | | | | | | | | | Air ch | anges per hou | ır |
| Infiltration due to chim | • | | | | | | | 0 | | ÷ (5) = | 0 | (8) |
| If a pressurisation test h | | | | ed, procee | d to (17), | otherwise o | continue fr | om (9) to (| (16) | | | ٦ |
| Number of storeys Additional infiltration | | elling (ne | 5) | | | | | | [(0) | 41-0-4 | 0 | (9) |
| Structural infiltration | | r stool or | timbort | frama ar | 0 25 fo | r macani | av constr | uction | [(9)- | 1]x0.1 = | 0 | (10) |
| if both types of wall a | | | | | | | • | uction | | | 0 | (11) |
| deducting areas of op | enings); if | equal user | 0.35 | | | | | | | | | - |
| If suspended wood | | | • | ed) or 0. | 1 (seale | ed), else | enter 0 | | | | 0 | (12) |
| If no draught lobby, | | | | | | | | | | | 0 | (13) |
| Percentage of wind | ows and | doors dr | aught st | ripped | | 0.25 10.2 | $(\sqrt{14}) \cdot 1$ | 001 - | | | 0 | (14) |
| Window infiltration Infiltration rate | | | | | | 0.25 - [0.2 (8) + (10) | | | + (15) - | | 0 | (15) |
| Air permeability val | 10, 050 | ovproced | d in cub | via motro | e nor he | | | | | oroo | 0 | (16) |
| If based on air perme | | | | | | • | • | | invelope | alea | 4.5999999046325 | 4 |
| Air permeability value a | • | | | | | | | is being u | sed | | 0.23 | (18) |
| Number of sides shell | | | | | | 5 | , | J | | | 2 | (19) |
| Shelter factor | | | | | | (20) = 1 - | [0.075 x (1 | 9)] = | | | 0.85 | (20) |
| Infiltration rate incorpo | orating sl | nelter fac | tor | | | (21) = (18 |) x (20) = | | | | 0.2 | (21) |
| Infiltration rate modifie | ed for mo | onthly win | d speed | 1 | | | | | | | | |
| Jan Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly average wind | speed f | rom Tabl | e 7 | | | | | | i | | | |
| (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 F | actor (2 | 22a)m = | (22)m ÷ | 4 | | | | | | | | | | |
|------------|------------|--------------------------------|----------------|-----------------------------|------------|----------------|----------------|-------------------------|-------------|----------------|-------------|--------------------|-----------|----------------|
| (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 | | |
| Adjuste | ed infiltr | ation rat | e (allow | ing for sł | nelter an | d wind s | speed) = | : (21a) x | (22a)m | | | | | |
| | 0.25 | 0.24 | 0.24 | 0.22 | 0.21 | 0.19 | 0.19 | 0.18 | 0.2 | 0.21 | 0.22 | 0.23 | | |
| | | <i>ctive air</i> al ventila | • | rate for t | he appli | cable ca | ise | | - | | - | | | |
| | | | | endix N (2 | 3h) - (23a | a) x Emv (e | equation (| N5)) , othe | rwise (23h | (23a) | | | 0.5 | (23a) |
| | | | | | | | | n Table 4h | |) = (200) | | | 0.5 | (23b) (23c) |
| | | | - | - | - | | | | | 2h)m + (| 23h) 🗙 [| 1 – (23c) | 0 | (230) |
| (24a)m= | 0 | | | 0 | 0 | 0 | | | | | | 0 | . 100] | (24a) |
| · · I | balance | d mecha | i anical ve | entilation | without | L heat rec | L coverv (l | 1 MV) (24b | (2) m = (2) | 1 2b)m + () | 1 23b) | | | |
| (24b)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24b) |
| , | | | | | • | • | | on from œ .c) = (22t | | .5 × (23b |) | | | |
| (24c)m= | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | | (24c) |
| | | | | | | | | on from l 0.5 + [(2 | | 0.5] | | | | |
| (24d)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24d) |
| Effec | ctive air | change | rate - er | nter (24a |) or (24b | o) or (24 | c) or (24 | ld) in bo | x (25) | - | | | | |
| (25)m= | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | | (25) |
| 3. Hea | at losse | s and he | eat loss | paramet | er: | | | | | | | | | |
| ELEN | | Gros area | SS | Openin m | gs | Net Ar A ,r | | U-val W/m2 | | A X U (W/I | K) | k-value kJ/m²·ł | | A X k kJ/K |
| Doors | | | 、 | | | 2.1 | x | 1.4 | = | 2.94 | , | | | (26) |
| Window | ws Type | e 1 | | | | 3.06 | x1 | /[1/(1.4)+ | 0.04] = | 4.06 | = | | | (27) |
| Windov | ws Type | 2 | | | | 6.51 | | /[1/(1.4)+ | 0.04] = | 8.63 | = | | | (27) |
| Floor | | | | | | 37.05 | 5 X | 0.11 | = | 4.0755 | | 75 | 27 | 78.75 (28) |
| Walls | | 44.6 | 6 | 11.6 | 7 | 32.99 | Э х | 0.24 | | 7.92 | | 60 | \dashv | 79.4 (29) |
| Roof | | 37.0 | | 0 | = | 37.05 | | 0.11 | | 4.08 | | 9 | \exists | 3.45 (30) |
| Total a | rea of e | lements | | L |] | 118.7 | 6 | L | | | I | | | (31) |
| Party w | | | | | | 85.46 | | 0 | = | 0 | | 45 | 38 | 45.7 (32) |
| - | l wall ** | | | | | 59.9 | | | | | I | 9 | \dashv | 9.136 (32c) |
| | l wall ** | | | | | 90.09 | | | | | | 9 | \dashv | .7722 (32c) |
| Interna | | | | | | 37.05 | | | | | [| 18 | \dashv | 66.9 (32d) |
| Interna | l ceiling | l | | | | 37.05 | | | | | [| 9 | \dashv | 3.45 (32e) |
| * for wind | dows and | roof wind | | effective wi nternal wal | | alue calcul | | g formula 1 | /[(1/U-valu | ue)+0.04] a | as given in | n paragraph | | |

Fabric heat loss, $W/K = S (A \times U)$ (26)...(30) + (32) =31.7(33)Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =11287.56(34)Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m²K= (34) ÷ (4) =152.33(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

| details of themal bridging are not known (36) = 0.0 × (31) (33) + (86) = (33) + (86) = (37) (details in heat loss (33) + (86) = (33) + (86) = (37) (details in heat loss calculated monthly (39) = 0.03 × (25) m × (5) (38) (a) | can be used instead of a detailed calculation. | | |
|---|--|--|--|
| fold fabric heat loss (3) + (36) = (38) / (36) = (38) / (36) / (3 | Thermal bridges : S (L x Y) calculated using Appendix K | 6.67 (36) | |
| Approximation heat loss calculated monthly (38) m = 0.33 × (25) m × (5) 30) m. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 30) m. 30.98 30.98 30.98 30.98 30.98 30.98 30.98 30.98 30.99< | if details of thermal bridging are not known (36) = $0.05 \times (31)$ | | |
| $ \frac{Jan}{30.99} \frac{Feb}{30.99} \frac{Mar}{30.99} \frac{Apr}{30.99} \frac{May}{30.99} \frac{Jun}{30.99} \frac{Jun}{30.99}$ | Total fabric heat loss (33) + (36) = | 38.37 (37) | |
| $ \frac{39,99}{30,99} \frac{30,99}{30,99} \frac{30,99}{30$ | Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ | | |
| Heat transfer coefficient, W/K (39)m = (37) + (38)m 39)m = (9:38 69:36 | Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov [| ec | |
| agima 69.36 <t< td=""><td>(38)m= 30.99 <t< td=""><td>99 (38)</td></t<></td></t<> | (38)m= 30.99 <t< td=""><td>99 (38)</td></t<> | 99 (38) | |
| Average = Sum(39)x/12= (39) (40)m = (39)m + (4) (40)m = (39)m + (4) (40)m = (39)m + (4) Average = Sum(39)x/12= (39) (40)m = (39)m + (4) Average = Sum(40)x/12= (40) Average = Sum(40)x/12= (42) Average = Sum(40)x/12= (40) Average = Sum(40)x/12= (40) Average Not Water usage in litres per day Vd, average = (25 x N) + 36 (42) Average Not Water usage in litres per day Vd, average = (25 x N) + 36 (43) | Heat transfer coefficient, W/K (39)m = (37) + (38)m | | |
| (40)m = (39)m + (4) (40)m = (39)m + (4) Average = Sum(40) | (39)m= 69.36 69.36 69.36 69.36 69.36 69.36 69.36 69.36 69.36 69.36 69.36 69.36 69.36 69.36 69.36 | 36 | |
| 40)m 0.94 | | 2= 69.36 (39) | |
| Average = Sum(40)/12=0.94Aumber of days in month (Table 1a)Average = Sum(40)/12=0.9441)m= $\frac{1}{31}$ $\frac{1}{28}$ $\frac{1}{31}$ $\frac{1}{30}$ $\frac{1}{31}$ $\frac{1}{31}$ $\frac{1}{30}$ $\frac{1}{31}$ $\frac{1}{30}$ $\frac{1}{31}$ $\frac{1}{30}$ $\frac{1}{31}$ $\frac{1}{31}$ $\frac{1}{31}$ $\frac{1}{31}$ | | | |
| Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 31 28 31 30 31 30 31 30 31 30 31 30 31(41) 4. Water heating energy requirement:WWhyear:A. Mar Apr May Jun Jul Aug Sep Oct Nov DecAug Mar Apr May Jun Jul Aug Sep Oct Nov DecAug Mar Apr May Jun Jul Aug Sep Oct Nov DecAug Mar Apr May Jun Jul Aug Sep Oct Nov DecAug Mar Apr May Jun Jul Aug Sep Oct Nov DecAug Mar Apr May Jun Jul Aug Sen Oct | | | |
| 41 me3128313031313233 <th< td=""><td>Average = $Sum(40)_{112}/1$ Number of days in month (Table 1a)</td><td>2= 0.94 (40)</td></th<> | Average = $Sum(40)_{112}/1$ Number of days in month (Table 1a) | 2= 0.94 (40) | |
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|----------------------|------------------|-----------------------|---------------------------------------|----------------|-----------|----------------------|-----------------|---------------------|--------------|----------------|------------------|---------------|---------------|--------------|
| | | m water (54) in (5 | - | , KVVN/Y6 | ear | | | (47) x (51) |) X (52) X (| 53) = | | <u>כ</u> כ | | (54) (55) |
| | . , | loss cal | | for each | month | | | ((56)m = (| 55) x (41) | m | | 5 | | (00) |
| | | | | | | | r | | | - | 0 | 0 | I | (56) |
| (56)m= If cylinde | 0 er contains | 0 s dedicate | 0 d solar sto | 0 rage (57) | 0 = (56)m | $0 \times [(50) - ($ | 0 H11)1 ∸ (5 | 0 0) else (5 | 0 = (56) | 0 m where (| 0 H11) is fro | 0 m Append | ix H | (30) |
| - | | | | - · · | I | 1 | | | | | | | | |
| (57)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (57) |
| | - | loss (an | | | | | | | | | | 0 | | (58) |
| | • | loss cal | | | ` | , | · · | • • • | | | | | | |
| • | | i | | 1 | 1 | i | i | <u> </u> | | r thermo | , | - | l | (50) |
| (59)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (59) |
| Combi | loss ca | lculated | for each | month (| (61)m = | (60) ÷ 36 | 65 × (41) |)m | | | | | | |
| (61)m= | 13.76 | 12.43 | 13.76 | 13.31 | 13.76 | 13.31 | 13.76 | 13.76 | 13.31 | 13.76 | 13.31 | 13.76 | | (61) |
| Total h | eat requ | uired for | water he | eating ca | alculated | for eac | h month | (62)m = | 0.85 × (| (45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= | 160.26 | 140.56 | 145.98 | 128.59 | 124.36 | 108.76 | 102.2 | 115.25 | 116.02 | 133.45 | 143.96 | 155.64 | | (62) |
| Solar Dł | HW input o | calculated | using App | endix G or | Appendix | H (negati | ve quantity | v) (enter '0 | ' if no sola | r contributi | on to wate | r heating) | | |
| (add a | dditiona | l lines if | FGHRS | and/or V | WWHRS | applies | , see Ap | pendix C | G) | | | | | |
| (63)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| FHRS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) (G2) |
| Output | from w | ater hea | ter | | | | | | | | | | | |
| (64)m= | 160.26 | 140.56 | 145.98 | 128.59 | 124.36 | 108.76 | 102.2 | 115.25 | 116.02 | 133.45 | 143.96 | 155.64 | | |
| | | | | | | | | Outp | out from wa | ater heater | (annual) | 12 | 1575.01 | (64) |
| Heat g | ains fro | m water | heating, | kWh/mo | onth 0.2 | 5 ´ [0.85 | × (45)m | + (61)m | n] + 0.8 x | ((46)m | + (57)m | + (59)m |] | |
| (65)m= | 52.15 | 45.71 | 47.4 | 41.66 | 40.22 | 35.06 | 32.85 | 37.18 | 37.48 | 43.24 | 46.77 | 50.61 | | (65) |
| inclu | ide (57) | m in calo | culation | of (65)m | only if c | ylinder i | s in the o | dwelling | or hot w | ater is fr | om com | munity h | eating | |
| | . , | ains (see | | . , | - | | | U | | | | • | | |
| | | s (Table | | | | | | | | | | | | |
| Melab | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (66)m= | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | | (66) |
| | | (calcula | | | | | | | | | | | | |
| (67)m= | 20.12 | 17.87 | 14.53 | 11 | 8.22 | 6.94 | 7.5 | 9.75 | 13.09 | 16.62 | 19.4 | 20.68 | l | (67) |
| | | | | | | | | | | | 10.4 | 20.00 | | (0.) |
| •• | | ins (calc 208.82 | 203.41 | 191.91 | 177.38 | 163.73 | 13 OF L1 | 3a), aisc 152.47 | 157.87 | 169.38 | 183.9 | 197.55 | l | (68) |
| (68)m= | | | | | | | | | | | 163.9 | 197.55 | | (00) |
| | | (calcula | | - | · · · | | , | | | | | | l | (00) |
| (69)m= | | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | | (69) |
| • | | ns gains | · · · · · · · · · · · · · · · · · · · | · · | r | r | r | | | · · · · · · | | | I | |
| (70)m= | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | (70) |
| Losses | s e.g. ev | aporatio | n (nega | tive valu | es) (Tab | le 5) | | | | | | | | |
| (71)m= | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | | (71) |
| Water | heating | gains (T | able 5) | | | | | | | | | | | |
| (72)m= | 70.1 | 68.02 | 63.71 | 57.86 | 54.05 | 48.7 | 44.15 | 49.98 | 52.05 | 58.11 | 64.96 | 68.03 | | (72) |
| Total i | nternal | gains = | | | | (66) | m + (67)m | ı + (68)m + | + (69)m + (| (70)m + (7 | 1)m + (72) | m | | |
| (73)m= | 358.01 | 355.83 | 342.78 | 321.89 | 300.78 | 280.5 | 267.39 | 273.32 | 284.14 | 305.23 | 329.38 | 347.38 | | (73) |
| | | | | | | - | | | | | | | • | |

6. Solar gains:

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

| Orientation: | e calculated usin Access Fact Table 6d | - | Area m² | adie 6a | anda | Flux Flux Tabl | | itions | g | | | FF Table 6c | uon. | | Gains (W) | |
|----------------|--|----------|------------|---------|----------|----------------------|----------|--------|---------|-------|--------|----------------|------|-----|--------------|------|
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 36. | .79 | x | 0 | .45 | x | 1.11 | | = | 83 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 62. | .67 | x | 0 | .45 | x | 1.11 | | = | 141.37 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | ×Ī | 85. | .75 | x | 0 | .45 | x | 1.11 | | = | 193.43 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 106 | 6.25 | x | 0 | .45 | x | 1.11 | | = | 239.67 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | ×Ī | 119 | 9.01 | x | 0 | .45 | x | 1.11 | | = | 268.45 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 118 | 3.15 | x | 0 | .45 | x | 1.11 | | = | 266.51 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 113 | 8.91 | x | 0 | .45 | x | 1.11 | | = | 256.95 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 104 | .39 | x | 0 | .45 | x | 1.11 | | = | 235.48 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 92. | .85 | x | 0 | .45 | x | 1.11 | | = | 209.45 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 69. | .27 | x | 0 | .45 | x | 1.11 | | = | 156.25 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 44. | .07 | x | 0 | .45 | x | 1.11 | | = | 99.41 | (77) |
| Southeast 0.9x | 0.77 | × | 6.51 | | × | 31. | .49 | x | 0 | .45 | x | 1.11 | | = | 71.03 | (77) |
| Northwest 0.9x | 0.77 | × | 3.06 | 3 | × | 11. | .28 | x | 0 | .45 | x | 1.11 | | = | 11.96 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 6 | × | 22. | .97 | x | 0 | .45 | x | 1.11 | | = | 24.35 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 6 | × | 41. | .38 | x | 0 | .45 | x | 1.11 | | = | 43.87 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 3 | × | 67. | .96 | x | 0 | .45 | x | 1.11 | | = | 72.05 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 3 | × | 91. | .35 | x | 0 | .45 | x | 1.11 | | = | 96.85 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 6 | × | 97. | .38 | x | 0 | .45 | x | 1.11 | | = | 103.26 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 3 | × | 91 | .1 | x | 0 | .45 | x | 1.11 | | = | 96.59 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 6 | × | 72. | .63 | x | 0 | .45 | x | 1.11 | | = | 77.01 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 3 | × | 50. | .42 | x | 0 | .45 | x | 1.11 | | = | 53.46 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 3 | × | 28 | .07 | x | 0 | .45 | x | 1.11 | | = | 29.76 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 6 | × | 14 | .2 | x | 0 | .45 | x | 1.11 | | = | 15.05 | (81) |
| Northwest 0.9x | 0.77 | × | 3.06 | 3 | × | 9.2 | 21 | x | 0 | .45 | x | 1.11 | | = | 9.77 | (81) |
| Solar gains i | n watts, calcu | <u> </u> | for each | month | _ | | | (83)m |) = Sum | (74)m | (82)m | | | - | | |
| (83)m= 94.96 | | 7.31 | 311.73 | 365.31 | 1 | 9.77 | 353.54 | 312 | - | 62.91 | 186.0 | 1 114.46 | 80. | 8 | | (83) |
| Total gains - | internal and | solar | (84)m = | (73)m | + (8 | 3)m , v | watts | | | Į | | | I | | | |
| (84)m= 452.9 | 7 521.55 58 | 0.09 | 633.61 | 666.09 | 65 | 0.27 | 620.93 | 585 | 5.8 5 | 47.04 | 491.24 | 4 443.84 | 428. | .18 | | (84) |
| 7. Mean inte | ernal tempera | ature (| heating | seasor | 1) | | | | | • | | • | | | | |
| | e during heat | ``` | Ŭ | | <i>.</i> | area fro | om Tab | ole 9, | , Th1 (| (°C) | | | | | 21 | (85) |
| Utilisation fa | actor for gains | s for li | ving area | a, h1,m | n (se | e Tab | le 9a) | | | . , | | | | I | | |
| Jan | | Mar | Apr | May | T È | Jun | Jul | A | ug | Sep | Oct | Nov | De | ес | | |
| (86)m= 0.99 | 0.97 0 | .95 | 0.9 | 0.79 | 0 | .63 | 0.48 | 0.5 | 52 | 0.74 | 0.92 | 0.98 | 0.9 | 9 | | (86) |
| Mean intern | al temperatu | re in li | ving are | a T1 (f | ollov | v step | s 3 to 7 | r in T | able 9 | | | • | | | | |
| (87)m= 19.62 | I | 0.12 | 20.47 | 20.77 | 1 | 0.93 | 20.98 | 20. | - | 20.86 | 20.48 | 19.97 | 19.5 | 56 | | (87) |
| | e during heat | | | | I | | rom Ta | | | (°C) | | | I | | | |
| (88)m= 20.14 | <u> </u> | 0.14 | 20.14 | 20.14 | - | D.14 | 20.14 | 20. | · · | 20.14 | 20.14 | 20.14 | 20.1 | 14 | | (88) |
| | _II | | | | 1 | I | | I | | | | | I | | | |

| Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) | |
|---|-------|
| (89)m= 0.98 0.97 0.94 0.87 0.75 0.56 0.39 0.43 0.68 0.9 0.97 0.99 | (89) |
| Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) | |
| | (90) |
| $fLA = Living area \div (4) = 0.2$ | (91) |
| Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ | |
| | (92) |
| Apply adjustment to the mean internal temperature from Table 4e, where appropriate | |
| (93)m= 18.87 19.07 19.36 19.71 19.98 20.12 20.15 20.15 20.06 19.72 19.22 18.81 | (93) |
| 8. Space heating requirement | |
| Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate | |
| the utilisation factor for gains using Table 9a | |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec | |
| Utilisation factor for gains, hm: (94)m= 0.98 0.96 0.93 0.86 0.74 0.56 0.39 0.43 0.68 0.89 0.96 0.98 | (94) |
| Useful gains, hmGm , W = (94) m x (84) m | (34) |
| | (95) |
| Monthly average external temperature from Table 8 | () |
| | (96) |
| Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m] | |
| (97)m= 1010.66 982.81 892.27 749.55 574.23 382.72 246.53 260.08 413.72 632.36 840.66 1013.55 | (97) |
| Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m | |
| (98)m= 422.48 323.46 262.59 146.61 61.89 0 0 0 0 146.22 297.82 441.39 | |
| Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 2102.45 | (98) |
| Space heating requirement in kWh/m²/year 28.37 | (99) |
| 9a. Energy requirements – Individual heating systems including micro-CHP) | |
| Space heating: | |
| Fraction of space heat from secondary/supplementary system 0 | (201) |
| Fraction of space heat from main system(s)(202) = 1 - (201) =1 | (202) |
| Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ | (204) |
| Efficiency of main space heating system 1 90.5 | (206) |
| Efficiency of secondary/supplementary heating system, % | (208) |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year | |
| Space heating requirement (calculated above) | |
| 422.48 323.46 262.59 146.61 61.89 0 0 0 0 146.22 297.82 441.39 | |
| $(211)m = \{[(98)m \times (204)]\} \times 100 \div (206)$ | (211) |
| 466.83 357.42 290.15 162 68.38 0 0 0 161.57 329.08 487.72 | . , |
| Total (kWh/year) =Sum(211) _{15,1012} = 2323.15 | (211) |
| Space heating fuel (secondary), kWh/month | |
| $= \{ [(98)m \times (201)] \} \times 100 \div (208) $ | |
| (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| Total (kWh/year) =Sum(215) _{15,1012} = 0 | (215) |

Water heating

| Output | from w | ater hea | ter (calc | ulated a | oove) | | | | | | | | | |
|---|------------|------------|------------|-----------|-----------|------------|-----------|-----------|------------|----------|---------|--------|----------|--------|
| 160.26 140.56 145.98 128.59 124.36 108.76 102.2 115.25 116.02 133.45 143.96 155.6 | | | | | | | | | | | | | | _ |
| Efficien | cy of w | ater hea | ter | | | | | | | | | | 87.3 | (216) |
| (217)m= | 89.6 | 89.51 | 89.33 | 88.98 | 88.34 | 87.3 | 87.3 | 87.3 | 87.3 | 88.94 | 89.43 | 89.64 | | (217) |
| | | heating, | | | | | | | | | | | | |
| · · · | | m x 100 | | | 4.40.70 | 404.50 | 447.07 | 400.04 | 400.00 | 450.00 | 400.00 | 470.00 | I | |
| (219)m= | 178.87 | 157.04 | 163.41 | 144.52 | 140.78 | 124.58 | 117.07 | 132.01 | 132.89 | 150.03 | 160.98 | 173.62 | | 1 |
| | | | | | | | | Tota | I = Sum(2 | | | | 1775.8 | (219) |
| Annua | | | | | | | | | | k\ | Wh/year | • | kWh/year | 1 |
| Space | heating | fuel use | ed, main | system | 1 | | | | | | | | 2323.15 | |
| Water heating fuel used | | | | | | | | | | | | 1775.8 |] | |
| Electric | ity for p | oumps, fa | ans and | electric | keep-ho | t | | | | | | | | |
| mecha | anical v | entilatior | n - balan | ced, ext | ract or p | ositive ir | nput fron | n outside | Ð | | | 49.6 | | (230a) |
| centra | l heatin | g pump: | | | | | | | | | | 30 | | (230c) |
| boiler | with a f | an-assis | ted flue | | | | | | | | | 45 | | (230e) |
| Total el | ectricity | / for the | above, ł | (Wh/yea | r | | | sum | of (230a). | (230g) = | | | 124.6 | (231) |
| Electric | ity for li | ghting | | | | | | | | | | | 355.33 | (232) |
| Electric | ity gene | erated by | y PVs | | | | | | | | | | -240.96 | (233) |
| Total de | eliverec | l energy | for all us | ses (211 |)(221) | + (231) | + (232). | (237b) | = | | | | 4337.92 | (338) |
| 12a. C | CO2 em | issions - | – Individ | ual heati | ng syste | ems inclu | iding mi | cro-CHP |) | | | | | |

| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
|---|---------------------------------|-------------------------------|---------------------------------|
| Space heating (main system 1) | (211) x | 0.216 = | 501.8 (261) |
| Space heating (secondary) | (215) x | 0.519 = | 0 (263) |
| Water heating | (219) x | 0.216 = | 383.57 (264) |
| Space and water heating | (261) + (262) + (263) + (264) = | | 885.37 (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x | 0.519 = | 64.67 (267) |
| Electricity for lighting | (232) x | 0.519 = | 184.42 (268) |
| Energy saving/generation technologies Item 1 | | 0.519 = | -125.06 (269) |
| Total CO2, kg/year | sum | of (265)(271) = | 1009.4 (272) |
| Dwelling CO2 Emission Rate | (272 | 2) ÷ (4) = | 13.62 (273) |
| EI rating (section 14) | | | 89 (274) |

| | | | | | | User D | etails: | | | | | | |
|---------------------|----------------------------------|--------------|--------------------|-------------|--------------------|-------------------------|-----------------|--------------|-------------------|------------|-----------|-------------------------|------|
| Assesso Software | | | n Tunniı oma FS | ••• | | | Strom Softwa | are Vei | rsion: | | | 027495 on: 1.0.5.41 | |
| | | | | | | | Address | | | | | | |
| Address | | | Buttercu | p Road , | , Bishops | s Waltha | am, SOU | THAMP | TON , S | 032 1RI | F | | |
| 1. Overall | dwelling di | mension | S: | | | | | | | | | | |
| 0 14 | | | | | | | a(m²) | I | Av. He | ight(m) | 1 | Volume(m ³) | - |
| Ground flo | or | | | | | 3 | 37.05 | (1a) x | 2 | 2.4 | (2a) = | 88.92 | (3a) |
| First floor | | | | | | 3 | 37.05 | (1b) x | 2 | .67 | (2b) = | 98.92 | (3b) |
| Total floor | area TFA = | (1a)+(1l | o)+(1c)+(| (1d)+(1e | e)+(1r | n) | 74.1 | (4) | | | | | |
| Dwelling vo | olume | | | | | | | (3a)+(3b) |)+(3c)+(3d | l)+(3e)+ | .(3n) = | 187.84 | (5) |
| 2. Ventilat | tion rate: | | | | | | | | | | | | _ |
| | | | main heating | | econdar neating | у | other | | total | | | m ³ per hour | |
| Number of | chimneys | Ľ | 0 | + | 0 | + | 0 |] = [| 0 | x 4 | 40 = | 0 | (6a) |
| Number of | open flues | Γ | 0 |] + [| 0 |] + [| 0 |] = [| 0 | x 2 | 20 = | 0 | (6b) |
| Number of | intermittent | fans | | | | | | - F | 3 | x 1 | 10 = | 30 | (7a) |
| Number of | passive ver | nts | | | | | | Ē | 0 | x 1 | 10 = | 0 | (7b) |
| Number of | flueless ga | s fires | | | | | | Г | 0 | x 4 | 40 = | 0 | (7c) |
| | | | | | | | | _ | | | A := | | _ |
| Infiltration | dua ta abima | a a sua di s | | | a) . (6b) . (7 | (a) . (7 b) . (| 70) - | Г | | | | hanges per ho | - |
| | due to chim risation test ha | | | | | | | continue fr | 30 om (9) to (| | ÷ (5) = | 0.16 | (8) |
| | of storeys in | | | | .,, | | | | - (-) - (| -/ | | 0 | (9) |
| | al infiltration | | Ū (| , | | | | | | [(9)- | -1]x0.1 = | 0 | (10) |
| Structura | al infiltration | : 0.25 fo | r steel or | timber t | frame or | 0.35 fo | r masoni | ry constr | ruction | | | 0 | (11) |
| - | pes of wall ar | | | | ponding to | the great | ter wall are | a (after | | | | | |
| | nded woode | 0 // | , | | ed) or 0. | 1 (seale | ed), else | enter 0 | | | | 0 | (12) |
| If no dra | ught lobby, | enter 0.0 |)5, else e | enter 0 | | | | | | | | 0 | (13) |
| Percenta | age of windo | ows and | doors dr | aught st | ripped | | | | | | | 0 | (14) |
| Window | infiltration | | | | | | 0.25 - [0.2 | 2 x (14) ÷ 1 | = [00 | | | 0 | (15) |
| Infiltratio | n rate | | | | | | (8) + (10) | + (11) + (1 | 2) + (13) - | + (15) = | | 0 | (16) |
| | eability valu | • | - | | | • | • | • | etre of e | nvelope | area | 5 | (17) |
| | air permea | - | | | | | | | . , . | | | 0.41 | (18) |
| | ability value ap sides shelte | | ressurisatio | on test has | s been don | ie or a de | gree air pe | rmeability | is being us | sed | | | (19) |
| Shelter fac | | sieu | | | | | (20) = 1 - | [0.075 x (1 | 9)] = | | | 2 0.85 | (19) |
| | ate incorpo | rating sh | nelter fac | tor | | | (21) = (18 |) x (20) = | | | | 0.35 | (21) |
| | ate modifie | • | | | ł | | | | | | | | J` |
| | an Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly av | erage wind | speed f | rom Tabl | e 7 | | | - | - | - | | - | • | |
| (22)m= 5. | | 4.9 | 4.4 | 4.3 | 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 | | |

| Wind F | actor (2 | 22a)m = | (22)m ÷ | 4 | | | | | | | | | | |
|---------|-------------|--------------|-----------|---------------|-----------|-----------------|-----------------------|-------------------------|----------|----------------|--------------|----------------------|----------|-------|
| (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 | | |
| Adjuste | ed infiltra | ation rate | e (allowi | ng for sh | nelter an | d wind s | speed) = | = (21a) x | (22a)m | | | | | |
| [| 0.44 | 0.44 | 0.43 | 0.38 | 0.37 | 0.33 | 0.33 | 0.32 | 0.35 | 0.37 | 0.39 | 0.41 | | |
| | | ctive air d | • | rate for t | he appli | cable ca | se | • | | • | | | | |
| | | al ventila | | " N (0 | |) – (| | | . (00) |) (22) | | | 0 | (23a) |
| | | | • • • | | , , | , , | • | (N5)) , othe | | o) = (23a) | | | 0 | (23b) |
| | | | - | - | - | | | m Table 4h | | | | | 0 | (23c) |
| ŕ | | | | i | 1 | · · · · · · | <u> </u> | ′HR) (24a | ŕ | 1 (| r <u>, -</u> | r í í | ÷ 100] | |
| (24a)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24a) |
| b) If I | balance | d mecha | anical ve | entilation | without | heat rec | overy (| MV) (24b | o)m = (2 | 2b)m + (2 | 23b) | | L | |
| (24b)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24b) |
| , | | | | | • | • | | on from c 4c) = (22t | | .5 x (23b |)) | | | |
| (24c)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24c) |
| | natural | ventilatio | on or wh | l ole hous | L | l /e input : | L ventilat | ion from l | l | I | | | | |
| , | | | | | | • | | 0.5 + [(2 | | 0.5] | | | | |
| (24d)m= | 0.6 | 0.59 | 0.59 | 0.57 | 0.57 | 0.55 | 0.55 | 0.55 | 0.56 | 0.57 | 0.58 | 0.58 | | (24d) |
| Effec | tive air | change | rate - er | nter (24a |) or (24t | o) or (24 | c) or (2 [,] | 4d) in box | x (25) | | | - | | |
| (25)m= | 0.6 | 0.59 | 0.59 | 0.57 | 0.57 | 0.55 | 0.55 | 0.55 | 0.56 | 0.57 | 0.58 | 0.58 | | (25) |
| 2.110 | | | | | | | • | • | • | • | 1 | | | |
| | | s and he | | | | Net Ar | ~~~ | U-valı | | AXU | | k-value | | AXk |
| ELEM | | Gros area | | Openin m | - | A,r | | W/m2 | | (W/I | K) | kJ/m ² ·ł | | kJ/K |
| Doors | | | | | | 2.1 | × | 1 | = | 2.1 | | | | (26) |
| Window | vs Type | e 1 | | | | 3.06 | x | 1/[1/(1.4)+ | 0.04] = | 4.06 | | | | (27) |
| Window | vs Type | 2 | | | | 6.51 | × | 1/[1/(1.4)+ | 0.04] = | 8.63 | | | | (27) |
| Floor | | | | | | 37.05 | | 0.13 | | 4.8165 | ı آ | | | (28) |
| Walls | | 44.6 | 6 | 11.6 | 7 | 32.99 | | 0.18 | = | 5.94 | = i | | \dashv | (29) |
| Roof | | 37.0 | | 0 | | 37.05 | | 0.13 | = | 4.82 | | | \dashv | (30) |
| | rea of e | lements | | | | 118.7 | | 0110 | | | L | | L | (31) |
| Party w | | | , | | | 85.46 | | 0 | | 0 | | | | (32) |
| - | I wall ** | | | | | 59.9 | | | | Ŭ | L [| | \dashv | (32c) |
| | I wall ** | | | | | 90.09 | | | | | L | | \dashv | (32c) |
| Interna | | | | | | 37.05 | | | | | l ſ | | \dashv | (32d) |
| | | | | | | | | | | | | | \dashv | |
| mema | l ceiling | | | | | 37.05 | 5 | | | | | | | (32e) |

| Fabric heat loss, $W/K = S (A \times U)$ | (26)(30) + (32) = | 30.36 | (33) |
|---|--|----------|------|
| Heat capacity $Cm = S(A \times k)$ | ((28)(30) + (32) + (32a)(32e) = | 11287.56 | (34) |
| Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K | Indicative Value: Medium | 250 | (35) |
| For design assessments where the details of the construction are not linear | a number of the indication of the first of | | - |

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

| can be u | sed inste | ad of a de | tailed calc | ulation. | | | | | | | | | | |
|------------|------------|----------------------------|------------------|-------------|----------------|-------------|------------|-------------|-----------------------|------------------------|---------------------------------------|---------|---------|------|
| Therma | al bridg | es : S (L | x Y) cal | culated | using Ap | pendix l | < | | | | | | 8.44 | (36) |
| if details | of therma | al bridging | are not kn | own (36) = | = 0.05 x (3 | 1) | | | | | | | | |
| Total fa | abric he | at loss | | | | | | | (33) + | (36) = | | | 38.79 | (37) |
| Ventila | tion hea | at loss ca | alculated | monthl | y | - | - | - | (38)m | = 0.33 × (| 25)m x (5) | - | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (38)m= | 37.1 | 36.87 | 36.63 | 35.54 | 35.34 | 34.39 | 34.39 | 34.21 | 34.75 | 35.34 | 35.75 | 36.18 | | (38) |
| Heat tr | ansfer o | coefficier | nt, W/K | | | | | | (39)m | = (37) + (3 | 38)m | | | |
| (39)m= | 75.9 | 75.66 | 75.43 | 74.34 | 74.13 | 73.18 | 73.18 | 73 | 73.55 | 74.13 | 74.55 | 74.98 | | |
| Heat lo | ss para | ımeter (H | HP)W | /m²K | 1 | | 1 | | | Average = = (39)m ÷ | Sum(39)1. | 12 /12= | 74.34 | (39) |
| (40)m= | 1.02 | 1.02 | 1.02 | 1 | 1 | 0.99 | 0.99 | 0.99 | 0.99 | 1 | 1.01 | 1.01 | 1 | |
| (10) | 1.02 | 1.02 | | | | 0.00 | 0.00 | 0.00 | | | Sum(40)1 | | 1 | (40) |
| Numbe | er of day | /s in moi | nth (Tab | le 1a) | | | | | | Tronago | | | | |
| | 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) |
| | | | | | | | | | | | | | 1 | |
| 4. Wa | ter hea | ting enei | rav reau | irement: | | | | | | | | kWh/ye | ear: | |
| | | | 3) | | | | | | | | | | | |
| if TF | A > 13. | | | [1 - exp | (-0.0003 | 849 x (TF | -13.9 |)2)] + 0.(|)013 x (⁻ | TFA -13. | | 34 | | (42) |
| Annual | averag | | | | | | | (25 x N) | | | | .81 | | (43) |
| | | al average litres per j | | | | - | - | to achieve | a water us | se target o | f | | | |
| | | - · · | | | | i | · | | - | | 1 | | 1 | |
| Hot wate | Jan | Feb n litres per | Mar day for e | Apr Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| | | | | | | | | I | | | | | 1 | |
| (44)m= | 98.79 | 95.2 | 91.6 | 88.01 | 84.42 | 80.83 | 80.83 | 84.42 | 88.01 | 91.6 | 95.2 | 98.79 | | |
| Energy o | content of | hot water | used - cal | culated mo | onthly $= 4$. | 190 x Vd,r | n x nm x D | 0Tm / 3600 | | | m(44) ₁₁₂ = ables 1b, 1 | | 1077.7 | (44) |
| (45)m= | 146.5 | 128.13 | 132.22 | 115.27 | 110.61 | 95.45 | 88.44 | 101.49 | 102.7 | 119.69 | 130.65 | 141.88 | | |
| lf instant | aneous v | , vater heatii | ng at point | of use (no | o hot water | r storage), | enter 0 in | boxes (46 | | Total = Su | m(45) ₁₁₂ = | = | 1413.04 | (45) |
| (46)m= | 21.98 | 19.22 | 19.83 | 17.29 | 16.59 | 14.32 | 13.27 | 15.22 | 15.41 | 17.95 | 19.6 | 21.28 | 1 | (46) |
| · · · | storage | | 10.00 | 17.20 | 10.00 | 14.02 | 10.21 | 10.22 | 10.41 | 17.00 | 10.0 | 21.20 | | () |
| Storage | e volum | e (litres) | includir | ng any so | olar or W | /WHRS | storage | within sa | me ves | sel | | 0 | | (47) |
| If comr | nunity ł | neating a | ind no ta | nk in dw | velling, e | nter 110 | litres in | (47) | | | | | 1 | |
| Otherw | vise if no | o stored | hot wate | er (this ir | ncludes i | nstantar | neous co | mbi boil | ers) ente | ər '0' in (| 47) | | | |
| Water | storage | loss: | | | | | | | | | | | | |
| a) If m | anufact | urer's de | eclared I | oss facto | or is kno | wn (kWł | n/day): | | | | | 0 | | (48) |
| Tempe | rature f | actor fro | m Table | 2b | | | | | | | | 0 | | (49) |
| ••• | | m water | - | - | | | | (48) x (49) | = | | | 0 | | (50) |
| , | | urer's de | | • | | | | | | | | | 1 | |
| | | age loss neating s | | | e 2 (KW | n/litre/da | iy) | | | | | 0 | ļ | (51) |
| | - | from Ta | | 011 4.3 | | | | | | | | 0 | 1 | (52) |
| | | actor fro | | 2b | | | | | | | | 0 | | (52) |

| - | | | | | | | | (47) (54) | (50) (| 50) | | | I | (= .) |
|--|------------------|-----------------------|---------------------------------------|------------------|----------------|------------------|-----------------|------------------|-----------------|--------------|------------------|---------------|---------------|--------------|
| | | m water (54) in (5 | - | , KVVN/Ye | ear | | | (47) x (51) |) x (52) x (| 53) = | | 0 0 | | (54) (55) |
| | . , | loss cal | | for each | month | | | ((56)m = (| 55) x (41) | m | | 0 | i | (33) |
| | - | 0 | | | | | r | | | 0 | 0 | 0 | I | (56) |
| (56)m= If cylinde | 0 er contains | - | 0 d solar sto | 0 rage, (57)r | 0 m = (56)m | 0 x [(50) – (| 0 H11)] ÷ (5 | 0 0). else (5 | 0 7)m = (56) | m where (| 0 H11) is fro | 0 m Append | j lix H | (30) |
| - | | | | - · · | I | 1 | | | | | | | l | (57) |
| (57)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (57) |
| | | loss (an | | | | | | | | | | 0 | | (58) |
| | • | loss cal | | | ` | | · · | . , | | | | | | |
| • | · · | 1 | | 1 | i | r | i | <u> </u> | · · | r thermo | , | 0 | I | (59) |
| (59)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | l . | (59) |
| Combi | loss ca | lculated | for each | month (| (61)m = | (60) ÷ 36 | 65 × (41) |)m | | | | | | |
| (61)m= | 50.34 | 43.82 | 46.68 | 43.4 | 43.02 | 39.86 | 41.19 | 43.02 | 43.4 | 46.68 | 46.95 | 50.34 | | (61) |
| Total h | eat requ | uired for | water he | eating ca | alculated | for eac | h month | (62)m = | 0.85 × (| (45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= | 196.84 | 171.95 | 178.9 | 158.68 | 153.63 | 135.31 | 129.63 | 144.51 | 146.11 | 166.37 | 177.6 | 192.22 | | (62) |
| Solar DH | HW input of | calculated | using App | endix G or | · Appendix | H (negati | ve quantity | v) (enter '0 | ' if no sola | r contributi | on to wate | er heating) | | |
| (add a | dditiona | l lines if | FGHRS | and/or V | WWHRS | applies | , see Ap | pendix (| G) | | | | | |
| (63)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| FHRS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) (G2) |
| Output | from w | ater hea | ter | | | | | | | | | | | |
| (64)m= | 196.84 | 171.95 | 178.9 | 158.68 | 153.63 | 135.31 | 129.63 | 144.51 | 146.11 | 166.37 | 177.6 | 192.22 | | |
| | | | | | | | | Outp | out from wa | ater heater | r (annual)₁ | 12 | 1951.74 | (64) |
| Heat g | ains fro | m water | heating, | kWh/mo | onth 0.2 | 5 ´ [0.85 | × (45)m | + (61)m | n] + 0.8 > | k [(46)m | + (57)m | + (59)m |] | |
| (65)m= | 61.3 | 53.56 | 55.63 | 49.18 | 47.53 | 41.7 | 39.7 | 44.5 | 45 | 51.47 | 55.18 | 59.76 | | (65) |
| inclu | de (57) | m in calc | culation | of (65)m | only if c | ylinder i: | s in the a | dwelling | or hot w | ater is fr | om com | munity h | eating | |
| 5. Int | ernal ga | ains (see | Table 5 | and 5a |): | | | | | | | | | |
| | | s (Table | | | | | | | | | | | | |
| metab | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (66)m= | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | 117.07 | | (66) |
| | n dains | (calculat | | nendix | L equat | ion I 9 o | riga)a | lso see | L Table 5 | | | | ł | |
| (67)m= | 20.12 | 17.87 | 14.53 | 11 | 8.22 | 6.94 | 7.5 | 9.75 | 13.09 | 16.62 | 19.4 | 20.68 | 1 | (67) |
| | | ins (calc | | | | | | | | | - | | i | . , |
| 70000000000000000000000000000000000000 | | 208.82 | 203.41 | 191.91 | 177.38 | 163.73 | 154.61 | 152.47 | 157.87 | 169.38 | 183.9 | 197.55 | 1 | (68) |
| | | | | | | | | | | | 100.0 | 107.00 | Í | () |
| | | (calcula | | - | L, equal 34.71 | | , | | | | 24 71 | 24 71 | I | (69) |
| (69)m= | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | 34.71 | l | (03) |
| - | | ns gains | · · · · · · · · · · · · · · · · · · · | · · | | | | - | | | - | _ | I | (70) |
| (70)m= | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | (70) |
| | - | aporatio | · • | · · · · · · | · · · · | · · · | · | | | | | | I | |
| (71)m= | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | -93.66 | | (71) |
| Water | heating | gains (T | able 5) | i | i | i | i | | | i | | | 1 | |
| (72)m= | 82.39 | 79.7 | 74.78 | 68.3 | 63.89 | 57.92 | 53.37 | 59.81 | 62.5 | 69.18 | 76.64 | 80.32 | | (72) |
| Total i | nternal | gains = | | | | (66) | m + (67)m | ı + (68)m + | + (69)m + (| (70)m + (7 | 1)m + (72) | m | | |
| (73)m= | 370.3 | 367.51 | 353.84 | 332.33 | 310.62 | 289.72 | 276.61 | 283.16 | 294.58 | 316.3 | 341.06 | 359.68 | | (73) |

6. Solar gains:

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

| Orientation: | e calculated usir Access Fac Table 6d | • | Area m ² | I adle 6a | a and | Flu | | ations | g | J_ Die 6b | | FF Table 6c | lion. | | Gains (W) | |
|----------------|---|-----------|------------------------|-----------|-------|---------|-----------|------------|---------|--------------|--------|----------------|-------|------|--------------|------|
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 3 | 6.79 | x | (| 0.63 | x | 0.7 | | = | 73.2 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 6 | 2.67 | x | (| 0.63 | x | 0.7 | | = | 124.69 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | x 85.75 | | x | (| 0.63 | x | 0.7 | | = | 170.61 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 10 | 06.25 | x | (| 0.63 | x | 0.7 | | = | 211.39 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 1 | 19.01 | x | (| 0.63 | × | 0.7 | | = | 236.78 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 1 | 18.15 | x | (| 0.63 | × | 0.7 | | = | 235.06 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 1 | 13.91 | x | (| 0.63 | x | 0.7 | | = | 226.63 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 10 | 04.39 | x | (| 0.63 | × | 0.7 | | = | 207.69 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 9 | 2.85 | x | (| 0.63 | × | 0.7 | | = | 184.73 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 6 | 9.27 | x | (| 0.63 | x | 0.7 | | = | 137.81 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 4 | 4.07 | x | (| 0.63 | × | 0.7 | | = | 87.68 | (77) |
| Southeast 0.9x | 0.77 | x | 6.5 | 1 | x | 3 | 1.49 | x | (| 0.63 | x | 0.7 | | = | 62.65 | (77) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 1 | 1.28 | x | (| 0.63 | × | 0.7 | | = | 10.55 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 2 | 2.97 | x | (| 0.63 | x | 0.7 | | = | 21.48 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 4 | 1.38 | x | (| 0.63 | x | 0.7 | | = | 38.7 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 6 | 7.96 | x | (| 0.63 | × | 0.7 | | = | 63.55 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 9 | 1.35 | x | (| 0.63 | x | 0.7 | | = | 85.42 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 9 | 7.38 | x | (| 0.63 | × | 0.7 | | = | 91.07 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 9 | 91.1 | x | (| 0.63 | × | 0.7 | | = | 85.2 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 7 | 2.63 | x | (| 0.63 | x | 0.7 | | = | 67.92 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 5 | 0.42 | x | (| 0.63 | × | 0.7 | | = | 47.15 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 2 | 8.07 | x | (| 0.63 | × | 0.7 | | = | 26.25 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | | 14.2 | x | (| 0.63 | × | 0.7 | | = | 13.28 | (81) |
| Northwest 0.9x | 0.77 | x | 3.0 | 6 | x | 9 | 9.21 | x | (| 0.63 | × | 0.7 | | = | 8.62 | (81) |
| Solar gains i | n watte calci | | for each | a mont | h | | | - (83)m |) – Sum | า(74)m | (82)m | | | | | |
| (83)m= 83.75 | | T I | 274.94 | 322.2 | - | 26.14 | 311.82 | 275 | ī | 231.88 | 164.06 | 3 100.96 | 71 | .26 | | (83) |
| Total gains - | internal and | l solar | (84)m = | : (73)m | + (8 | 83)m | , watts | | | | | | | | | |
| (84)m= 454.00 | 6 513.68 50 | 63.15 | 607.28 | 632.82 | 6 | 15.85 | 588.43 | 558 | .76 5 | 526.47 | 480.36 | 6 442.02 | 430 | 0.94 | | (84) |
| 7. Mean inte | ernal tempera | ature (| heating | seaso | n) | | | | | | | | | | | |
| Temperatur | e during hea | ting pe | eriods ir | n the liv | ring | area f | from Tab | ole 9 | , Th1 | (°C) | | | | | 21 | (85) |
| Utilisation fa | actor for gain | ns for li | ving are | ea, h1,r | n (s | ее Та | ble 9a) | - | | | | | _ | | | |
| Jan | Feb | Mar | Apr | May | | Jun | Jul | A | ug | Sep | Oct | Nov | | Dec | | |
| (86)m= 1 | 1 (| 0.99 | 0.96 | 0.88 | (| 0.71 | 0.54 | 0.5 | 59 | 0.83 | 0.97 | 1 | | 1 | | (86) |
| Mean intern | al temperatu | ure in li | ving are | ea T1 († | follo | w ste | ps 3 to 7 | 7 in T | able | 9c) | | | | | | |
| (87)m= 19.94 | | 20.3 | 20.59 | 20.83 | _ | 20.96 | 20.99 | 20. | | 20.91 | 20.6 | 20.22 | 19 | .92 | | (87) |
| Temperatur | e during hea | tina pe | eriods ir | n rest o | f dw | vellina | from Ta | able 9 | 9. Th2 | 2 (°C) | | | | | | |
| (88)m= 20.06 | | 20.07 | 20.08 | 20.08 | - | 20.09 | 20.09 | 20 | · | 20.09 | 20.08 | 20.08 | 20 | 0.07 | | (88) |
| | | I | | | | | L | | | | | -! | | | | |

| (89)m= 1 0.99 0.98 0.95 0.84 0.63 0.43 0.48 0.77 0.96 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (00) 18.65 18.85 19.18 19.91 20.07 20.09 20.02 19.62 19.07 18.63 (00) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (20) 19.82 19.31 18.89 (02) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (33) (33) (35) S. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (94) Using atom factor for gains using Table 9a (94) (94) (95) (95) Monthly average external temperature from Table 8 (95) (96) (96) (97) (94) (95)m= 45.11 50.81 51.85 52.81 53.89 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (95) Monthly average external temperature | (89)m= | ion factor for g | ains for i | rest of d | velling, l | h2,m (se | e Table | 9a) | | | | | | |
|--|---|--|---|--|--|-----------------------------|-----------------------------|----------------|--------------------|-------------------------------|--|----------------------------|---------|-------------|
| (90)me 18.85 19.18 19.59 19.91 20.07 20.09 20.02 19.62 19.07 18.63 (90) ItA = Living area + (4) = 0.2 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) 19.81 19.11 18.49 (92) Apply adjustment to the mean internal temperature form Table 4e, where appropriate (93) 18.89 (93) 8. Space heating requirement So 1 20.2 20.28 20.2 19.82 19.31 18.89 (93) 8. Space heating requirement Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm: (94) (94) 10.49 0.84 0.85 0.5 0.77 0.95 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (96)me 43.2 43.9 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.62 267.29 279.99 407.78 458.66 438 429.54 (95) Monthl | | 1 0.99 | 0.98 | 0.95 | 0.84 | 0.63 | 0.43 | 0.48 | 0.77 | 0.96 | 0.99 | 1 | | (89) |
| (90)me 18.85 19.18 19.59 19.91 20.07 20.09 20.02 19.62 19.07 18.63 (90) ItA = Living area + (4) = 0.2 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) 19.81 19.11 18.49 (92) Apply adjustment to the mean internal temperature form Table 4e, where appropriate (93) 18.89 (93) 8. Space heating requirement So 1 20.2 20.28 20.2 19.82 19.31 18.89 (93) 8. Space heating requirement Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm: (94) (94) 10.49 0.84 0.85 0.5 0.77 0.95 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (96)me 43.2 43.9 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.43 51.62 267.29 279.99 407.78 458.66 438 429.54 (95) Monthl | Mean ii | nternal tempe | rature in | the rest | of dwelli | ng T2 (fo | ollow ste | eps 3 to 7 | 7 in Tabl | e 9c) | | | | |
| Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (a) (a) 18.91 19.11 19.41 19.8 20.1 20.28 20.28 20.2 19.82 19.31 18.89 (a) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (a) (a) (a) (a) (a) Space heating requirement Total temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (a) (a) (a) Unised tor for gains, hm: (a) (a) (b) (b) (c) (c) (b) (b) 0.99 0.94 0.84 0.65 0.5 0.77 0.95 0.99 1 (c) (c) (c) 0.99 0.98 0.84 0.65 0.5 0.77 0.95 0.99 1 (c) | | · | 1 | | | <u> </u> | | . <u> </u> | | , | 19.07 | 18.63 | | (90) |
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| Apply adjustment to the mean internal temperature from Table 4e, where appropriate (3) (3) 18.91 19.11 19.41 19.8 20.1 20.25 20.28 20.2 19.82 19.31 18.89 (93) Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (94) (94) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94) (94) (94) (94) (94) (94) (94) Useful gains, hmGm, W = (94)m x (84)m (95) (95) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (97) (96) (96) (97) (97) (96) (97) (97) (96) (97) (97) (98) (97) (97) (98) (97) (98) (98) (97) (97) (98) (98) (98) (97) (97) (98) (97) (97) (98) (98) | _ | <u>·</u> | r ` | | | | | <u> </u> | | 19.82 | 19.31 | 18.89 | | (92) |
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| the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.84 0.65 0.45 0.5 0.77 0.95 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m 452.11 501.13 571.85 532.98 398.42 267.29 279.99 407.78 458.66 438 429.54 (95) Monthly average external temperature from Table 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 rate for mean internal temperature, Lm, W =[(39)m x [(93)m- (96)m] (97)m (95)m] x (41)m (98)m = 488.91 380.15 313.99 171.47 66.8 0 0 0 167.4 339.41 499.94 Total per year (kWhyear) = Sum(98)s.ve = 2428.47 (98) 32.77 (99) Fraction of space | 8. Spac | ce heating req | uirement | | | | | | | | | | | |
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| Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.65 0.45 0.5 0.77 0.95 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95) (95) (95) (95) (95) (95) Monthly average external temperature from Table 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 rate for mean internal temperature, Lm, W = ((39)m x ((93)m - (96)m) (97) (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (97) (98)m= 48.91 380.15 31.99 171.47 66.8 0 0 0 167.4 339.81 499.94 Total per year (kWh/year) = Sum(98)s.u = 2428.47 (98) Space heating requirement in kWh/m ² /year 99 90 10 0 167.4 339.81 499.94 Total per year (kWh/year) = Sum(98)s.u = 2428.47 (98) 2/year </td <td>the utili</td> <td></td> <td><u> </u></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td> <td></td> <td></td> | the utili | | <u> </u> | | | | | | | | | _ | | |
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| (95)m= 452.11 509.13 551.43 571.85 532.98 398.42 267.29 279.99 407.78 458.66 438 429.54 (95) Monthly average external temperature from Table 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 rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m = 1109.25 1074.84 973.45 810 622.75 413.59 269 282.91 448.66 683.66 909.96 1101.5 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m 488.91 380.15 313.99 171.47 66.8 0 0 0 167.4 338.81 499.94 Cotal per year (kWh/year) = Sum(98)se.re 2428.47 (98) Space heating requirements - Individual heating systems including micro-CHP) Space heating: 0 (202) = 1 - (201) = 1 (202) Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) 1 <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.65</td> <td>0.45</td> <td>0.5</td> <td>0.77</td> <td>0.95</td> <td>0.99</td> <td>1</td> <td></td> <td>(94)</td> | | | | | | 0.65 | 0.45 | 0.5 | 0.77 | 0.95 | 0.99 | 1 | | (94) |
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| $(98)_{m} = 488.91 380.15 313.99 171.47 66.8 0 0 0 0 167.4 339.81 499.94$ $Total per year (kWh/year) = Sum(98)_{5012} = 2428.47 (98)$ Space heating requirement in kWh/m ² /year $32.77 (99)$ 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system $0 (201)$ Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.4 (206) Efficiency of secondary/supplementary heating system, % 0 (208) $Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year$ | | | 1 | | | | | | | | 909.96 | 1101.5 | | (97) |
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| Space heating requirement in kWh/m²/year 32.77 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) 5 Space heating: 0 (201) Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.4 (206) 1 (208) Image: The secondary/supplementary heating system, % 0 (208) (208) (208) Image: Space heating requirement (calculated above) 1 Jun Jul Aug Sep Oct Nov Dec kWh/year | (98)m= | 488.91 380.15 | 313.99 | 171.47 | 66.8 | 0 | 0 | 0 | 0 | 167.4 | 339.81 | 499.94 | | |
| 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.4 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) End En | | | - | | | | _ | Tota | l per year | (kWh/year |) = Sum(9 | 8)15,912 = | 2428.47 | (98) |
| Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.4 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) <td>Space</td> <td>heating requir</td> <td>ement in</td> <td>kWh/m²</td> <td>/year</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>32.77</td> <td>(99)</td> | Space | heating requir | ement in | kWh/m ² | /year | | | | | | | | 32.77 | (99) |
| Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.4 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) <td>9a. Ener</td> <td>rgy requireme</td> <td>nts – Indi</td> <td>vidual h</td> <td>eating sy</td> <td>/stems i</td> <td>ncluding</td> <td>micro-C</td> <td>CHP)</td> <td></td> <td></td> <td></td> <td></td> <td></td> | 9a. Ener | rgy requireme | nts – Indi | vidual h | eating sy | /stems i | ncluding | micro-C | CHP) | | | | | |
| Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.4 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) Image: space from the space from the space heating system (calculated above) Image: space from the space from the space from the space heating space heating requirement (calculated above) Image: space from the space from the space from the space heating requirement (calculated above) Image: space from the space from the space from the space from the space heating space heating requirement (calculated above) Image: space from the spac | | | | | | | 0 | | , | | | | | |
| Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.4 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) | Fractio | n of space he | at from s | econdar | //supple | mentary | system | | | | | | 0 | (201) |
| Efficiency of main space heating system 1 93.4 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) Image: Construction of the system of th | Fractio | n of space he | at from m | nain syst | em(s) | | | (202) = 1 - | - (201) = | | | | 1 | (202) |
| Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) Image: Calculated above | Fractio | n of total heat | ng from | main sys | stem 1 | | | (204) = (20 | 02) × [1 – | (203)] = | | | 1 | (204) |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) Image: Calculated above Image: Calculated above Image: Calculated above Image: Calculated above | Efficien | ncy of main sp | ace heat | ing syste | em 1 | | | | | | | | 93.4 | (206) |
| Space heating requirement (calculated above) | | ncy of seconda | rv/supple | omontor | , hooting | | n % | | | | | | 0 | (208) |
| Space heating requirement (calculated above) | Efficien | | u ji oʻqppi | emeniai | y nealing | y system | 1, 70 | | | | | | | |
| | Efficien | Jan Feb | | | | | | Αυα | Sep | Oct | Nov | Dec | kWh/ve | _l ar |
| 488.91 380.15 313.99 171.47 66.8 0 0 0 0 167.4 339.81 499.94 | | | Mar | Apr | May | Jun | | Aug | Sep | Oct | Nov | Dec | kWh/ye | ar |
| $(211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ (211) | Space | heating requir | Mar | Apr alculated | May d above) | Jun | Jul | | | | | | kWh/ye | ar |
| 523.46 407.02 336.18 183.58 71.52 0 0 0 179.23 363.83 535.27 | Space | heating requir 488.91 380.15 | Mar ement (c 313.99 | Apr alculated 171.47 | May d above) 66.8 | Jun | Jul | | | | | | kWh/ye | |
| Total (kWh/year) =Sum(211) _{15,1012} = 2600.08 (211) | Space (211)m = | heating requir 488.91 380.15 = {[(98)m x (20 | Mar ement (c 313.99)4)] } x 1 | Apr alculated 171.47 00 ÷ (20 | May d above) 66.8 | Jun 0 | Jul | 0 | 0 | 167.4 | 339.81 | 499.94 | kWh/ye | ar (211) |
| Space heating fuel (secondary), kWh/month | Space (211)m = | heating requir 488.91 380.15 = {[(98)m x (20 | Mar ement (c 313.99)4)] } x 1 | Apr alculated 171.47 00 ÷ (20 | May d above) 66.8 | Jun 0 | Jul | 0 | 0 | 167.4 179.23 | 339.81 363.83 | 499.94 535.27 | | (211) |
| $= \{ [(98)m \times (201)] \} \times 100 \div (208) $ | Space (211)m = | heating requir 488.91 380.15 = {[(98)m x (20 523.46 407.02 | Mar ement (c 313.99)4)] } x 1 336.18 | Apr alculated 171.47 00 ÷ (20 183.58 | May d above) 66.8 (6) 71.52 | Jun 0 | Jul | 0 | 0 | 167.4 179.23 | 339.81 363.83 | 499.94 535.27 | | (211) |
| (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | Space (211)m = | heating requir 488.91 380.15 = {[(98)m x (20 523.46 407.02 heating fuel (s | Mar ement (c 313.99 04)] } x 1 336.18 | Apr alculated 171.47 00 ÷ (20 183.58 y), kWh/ | May d above) 66.8 (6) 71.52 | Jun 0 | Jul | 0 | 0 | 167.4 179.23 | 339.81 363.83 | 499.94 535.27 | | (211) |
| Total (kWh/year) =Sum(215) _{15,1012} = 0 (215) | Space (211)m = (211)m = ((98)n | heating requir 488.91 380.15 = {[(98)m x (20 523.46 407.02 heating fuel (s m x (201)] } x 1 | Mar ement (c 313.99)4)] } x 1 336.18 secondar 00 ÷ (20 | Apr alculated 171.47 00 ÷ (20 183.58 y), kWh/ 8) | May d above) 66.8 (6) 71.52 month | Jun 0 0 | Jul 0 0 | 0 Tota 0 | 0 I (kWh/yea | 167.4 179.23 ar) =Sum(2 | 339.81 363.83 211) _{15,1012} 0 | 499.94 535.27 = 0 | | (211) |

Water heating

| Water neuting | | | | | | | | | |
|---|---|-----------|-------------|-----------|-----------------------|--------|------------|----------|--------|
| Output from water heater (calculated above) | | | r | | | | r | I | |
| 196.84 171.95 178.9 158.68 153.63 | 135.31 | 129.63 | 144.51 | 146.11 | 166.37 | 177.6 | 192.22 | | _ |
| Efficiency of water heater | | | - | - | | - | | 80.3 | (216) |
| (217)m= 87.25 86.99 86.45 85.25 83.11 | 80.3 | 80.3 | 80.3 | 80.3 | 85.07 | 86.66 | 87.35 | | (217) |
| Fuel for water heating, kWh/month | | | | | | | | | |
| (219)m = (64)m x 100 ÷ (217)m | | | | | · · · · · | | I | I | |
| (219)m= 225.61 197.66 206.93 186.14 184.84 | 168.5 | 161.44 | 179.96 | 181.95 | 195.58 | 204.94 | 220.06 | | - |
| | | | Tota | I = Sum(2 | 19a) ₁₁₂ = | | | 2313.61 | (219) |
| Annual totals | | | | | k | Wh/yea | r | kWh/year | - |
| Space heating fuel used, main system 1 | | | | | | | | 2600.08 | |
| Water heating fuel used | | | | | | | | 2313.61 |] |
| 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 | 75 | (231) | | | | | |
| Electricity for lighting | | | | | | | | 355.33 | (232) |
| Total delivered energy for all uses (211)(221) | + (231) | + (232). | (237b) | = | | | | 5344.02 | (338) |
| 12a. CO2 emissions – Individual heating syste | ms inclu | uding mi | cro-CHF |) | | | | | - |
| | Emissions | | | | | | | | |
| | hergy Emission fa Vh/year kg CO2/kWl | | | | | | kg CO2/yea | ır | |
| Space heating (main system 1) | (211 | l) x | | | 0.2 | 16 | = | 561.62 | (261) |
| Space heating (secondary) | (215 | 5) x | | | 0.5 | 19 | = | 0 | (263) |
| Water heating | (219 | 9) x | | | 0.2 | 16 | = | 499.74 | (264) |
| Space and water heating | (261 |) + (262) | + (263) + (| 264) = | | | | 1061.36 | (265) |
| Electricity for pumps, fans and electric keep-hot | (231 | l) x | | | 0.5 | 19 | = | 38.93 | (267) |
| Electricity for lighting | (232 | 2) x | | | 0.5 | 19 | = | 184.42 | (268) |
| | | | | | | | | | _ |
| Total CO2, kg/year | | | | sum o | of (265)(2 | 271) = | | 1284.7 | (272) |

TER =

17.34 (273)