

Residential Scheme

106 Bexley Road Erith DA8 3SP

Mechanical and Electrical Building Services Energy Strategy Report

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(T) 01795 538527 (E) enquiries@hawden-mep.co.uk (W) www.hawden-mep.co.uk

Hawden MEP Limited, 1st Floor Office, Brogdale Enterprise Suite, Brogdale Farm, Brogdale Road, Faversham, Kent ME13 8XZ

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Contents

| 1. | EXECUTIVE SUMMARY | 3 |
|----|--|----|
| 2. | INTRODUCTION | 4 |
| 3. | SITE DESCRIPTION | 4 |
| 4. | CALCULATION METHODS | 5 |
| 5. | ENERGY HEIRARCHY - DWELLINGS | 5 |
| 6. | ASSESSMENT OF CARBON DIOXIDE EMISSIONS - DWELLINGS | 10 |
| 7. | COOLING AND OVERHEATING | 12 |
| 8. | APPENDICES | 13 |

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1. EXECUTIVE SUMMARY

This energy strategy has been provided in response to the planning conditions relating to the proposed development at 106 Bexley Road, Erith, DA8 3SP.

The energy strategy has been prepared in line with the requirements set out within the London Plan 2021 energy policies, including the energy hierarchy. The London Plan 2021 requires that all major developments should be net zero, which means reducing greenhouse gas emissions in operation and minising both annual and peak energy demand in accordance with the following energy hierarchy:

Step 1. Be lean: use less energy and manage demand during operation

This has been achieved by passive design measures such as energy efficient lighting and ventilation, high levels of air tightness and increased insulating properties.

Step 2. Be Clean: exploit local energy resources and supply energy efficiently and cleanly

This has been reviewed and it has been demonstrated that heat networks or combined heat and power systems are not viable.

Step 3. Be Green: maximise opportunities for renewable energy by producing, storing and using renewable energy onsite. Note that a minimum on-site reduction of at least 35 per cent beyond Building Regulations is required. Where this cannot be achieved on-site, shortfalls should be made up through a cash in lieu contribution to the boroughs carbon offset fund or through off-site methods

This has been reviewed, with natural gas combination boilers complete with flue gas heat recovery serving the dwellings and photovoltaic technologies incorporated within the scheme.

A summary of the photovoltaic installations is shown below.

| PV Area (m ²) | kWp | kWh/annum | Total CO ₂ Savings (kg CO ₂ /year) |
|---------------------------|------|-----------|---|
| 24.5 | 4.95 | 4,145 | 965 |

Table 1 – Proposed photovoltaic installations

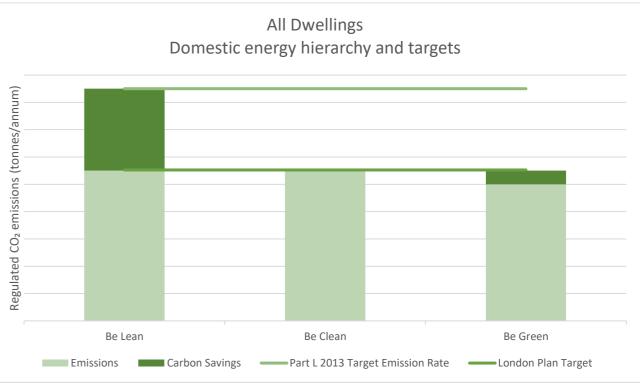
Note that CO2 savings are based upon SAP 10 carbon factors.

Step 4. Be Seen: monitor, verify and report on energy performance

Each property shall be complete with smart energy meters. This report also includes expected energy costs for each of the dwellings.

To summarise, the energy strategy achieves a 42% reduction of carbon emissions beyond 2013 Building Regulations

It should be noted that the scheme shall need to offset the remaining CO₂ emissions between 42% and 100% through a financial contribution to the Council's Carbon Offset Fund (COF) which equates to £1,800 per tonne. The total contribution for the domestic areas is £17,825.





T 01795 538527 E enquiries@hawden-mep.co.uk W www.hawden-mep.co.uk

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2. INTRODUCTION

This report provides the energy strategy for the proposed development of a 16-dwelling apartment block at 106 Bexley Road, Erith, DA8 3SP. The energy strategy has been prepared in line with the requirements set out within the London Plan 2021 energy policies, including the energy hierarchy.

This report contains the following information, in accordance with the London Plan:

- A calculation of the energy demand and carbon emissions covered by Building Regulations;
- Proposals to reduce carbon emissions beyond Building Regulations, including offsetting arrangements
- The results of dynamic overheating modelling
- Proposals for demand side response
- Proposals explaining how the site has been future-proofed to achieve zero carbon on-site emissions by 2050
- Plans for monitoring and annual reporting of energy demand and carbon emissions post-construction
- Expected costs to occupants associated with the proposed energy strategy
- Feasibility of creating or connecting to heat networks.

This report shall be read in conjunction with all other relevant consultant's reports, including those associated with the air quality assessment.

3. SITE DESCRIPTION

The site currently has an existing building that shall be extended and converted to make way for the proposed 16 dwelling apartment block. The works are to be carried out in a single stage.

The provision of a 16-dwelling apartment block of four storeys including a basement floor. The apartments consist of 1bed 2-person and 2-bed 3-person units.

The proposed site is shown in figure 1 below.



Figure 2 – Extract of Urban and Rural drawing B1353-102

As part of the planning application for the site, London Borough of Bexley Planning Application Requirements (17th October 2018) that an energy strategy be provided in line with the requirements of the The London Plan. Note that the guidance makes reference to the previous London Plan. An extract of the planning requirements is shown below:

- For major development proposals there are a number of London Plan requirements in respect of energy assessments, reduction of carbon emissions, sustainable design and construction, decentralised and renewable energy. The GLA guidance on preparing energy assessments should be followed when preparing energy assessments. Major developments are expected to prepare an energy strategy based upon the Mayors energy hierarchy adopting lean, clean, green principles. The assessment should demonstrate how the need for energy is to be minimised, and how it will be supplied to the particular development proposed. In accordance with the energy hierarchy in policy 5.2 of the London Plan, updated following the implementation of the 2013 Building

T 01795 538527 E enquiries@hawden-mep.co.uk W www.hawden-mep.co.uk

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Regulations, developments should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible. This applies to both residential and nondomestic buildings.

- As set out in the Mayor's Housing SPG (2016), a zero carbon standard will be applied to all new major residential development. The energy strategy shall include measures to achieve zero regulated carbon emissions.
- Where it is clearly demonstrated that the specific target cannot be fully achieved onsite, at least a 35% reduction in regulated carbon emissions beyond the baseline set out in the 2013 Building Regulations (Part L) must be demonstrated. The remaining regulated carbon emissions between this 35% and zero carbon (up to 100%) are to be off-set through a cash-in-lieu contribution of £60 per tonne of regulated CO2 over a 30 year period, as recommended by London Plan guidance. The cash in lieu contribution will be secured through a S106 for the delivery of carbon dioxide savings elsewhere.
- From 2019 non-domestic buildings will also be required to achieve zero carbon in accordance with London Plan policy 5.2.
- Options for producing renewable energy should also be assessed and should directly relate to the particular site and the feasibility of installing the various measures. The layout of the scheme should ensure that there is sufficient space on site for any equipment and fuel storage, if required, and should investigate implications of fuel delivery. The potential site and form of buildings and flues should be included in the information submitted with the application. In cases where the form of renewable energy cannot be fully determined at time of application, feasible options must still be presented. It is unlikely to be possible to submit details for the compliance of a condition regarding energy efficiency / renewable energy where additional permissions may be required (e.g. for flues or buildings not in the original application).
- Energy Assessments also need to demonstrate that connection to existing or planned district heating networks, including a future connection to the Riverside Resource Recovery Facility district heating network has been prioritised and should demonstrate that the development is designed to connect to the existing or future district heating network. Relevant correspondence with local heat network operators should be provided to support this.

The energy strategy has been produced in line with the following documents:

- The London Plan March 2021;
- Bexley Heat Map Study March 2021;
- Greater London Authority Energy Assessment Guidance (October 2018);
- Mayor's Sustainable Design and Construction Supplementary Planning Guidance (SPG);
- Domestic Building Services Compliance Guide (2013 Edition for use in England);
- GLA Carbon Emission Reporting Spreadsheet v1.1.

Note that the energy strategy within this report relates to the full planning application.

4. CALCULATION METHODS

Carbon dioxide emission rates have been calculated as follows:

Dwellings

- Dwelling CO₂ Emissions Rate (DER) calculated through the Part L 2013 of the Building Regulations methodology SAP 2012 and the GLA Carbon Emission Reporting Spreadsheet v1.1 to take into account SAP 10 carbon emission factors. This is multiplied by the cumulative floor area for the particular dwelling type in question to give the related CO₂ emissions;
- Separately, emissions associated with non-Building Regulation elements (i.e. cooking and appliances) established by using BREDEM (BRE Domestic Energy Model) or CIBSE Benchmark data.

A summary of the modelling work output (i.e. DER worksheets for dwellings) and domestic energy consumption and CO2 analysis screenshots have been provided within the appendix for each stage of the energy hierarchy.

The CO₂ emissions of all dwellings have then been summed to give the total regulated emissions for the domestic element of the development. These figures are expressed in tonnes per annum and included within the tables referenced GLA table 1 to 4.

5. ENERGY HEIRARCHY - DWELLINGS

To achieve the targets for minimising carbon dioxide emissions, the London Plan outlines a four-step energy hierarchy to guide developers on how they may design low or zero carbon development. The hierarchy consists of the following steps:

Step 1. Be lean: use less energy Step 2. Be clean: supply energy efficiently Step 3. Be green: use renewable energy Step 4. Be seen: monitor usage

These steps are detailed and expanded upon within the following sections.

5.1 Demand Reduction - Be Lean

The first step is to 'be lean' by seeking to minimise the carbon dioxide emissions of a development by minimising energy consumption during its construction and occupation. This can be achieved by passive design measures such as orientation and site layout, natural ventilation and lighting high thermal mass and solar shading. In line with the first step of the energy hierarchy, insulating properties (U-values) of the building fabric shall be increased, high levels of air tightness shall be achieved, and efficient services and lighting to reduce energy demand in dwellings shall be provided.

Site Orientation

The final location of the proposed building has already been agreed and therefore the repositioning of any areas is not feasible.

Building Fabric

In order to satisfy the target emission rate, the building specification shall be considerably better than the guidelines set of by Building Regulations. If financially viable, the guideline figures should be reduced as much as practicable in order to reduce building heat losses and the overall CO_2 emissions of the site. The target U-values are as follows:

| | U-Value (W/m ² K) | | |
|----------------|------------------------------|---------|--|
| Element | Base | Be Lean | |
| Glazing | 1.4 | 1.2 | |
| Solid Doors | 1.0 | 1.0 | |
| External wall | 0.18 | 0.16 | |
| Exposed floors | 0.13 | 0.11 | |
| Roof | 0.13 | 0.11 | |

Table 2 - Proposed U-Values

Thermal Bridging

Accredited Construction Details (ACD) shall be utilised to ensure the heat losses caused by thermal bridging are reduced as much as is practically possible. ACDs covering the lintels, sills, jambs, exposed floor, party floor between dwellings and party wall between dwellings shall be used as a minimum.

Air Tightness

Air tightness shall also affect the heat losses and therefore it is suggested that the building is constructed as 'tight' as possible. The target air permeability for the dwellings is $4m^3/h/m^2$ at 50Pa.

Water Usage

The water usage within the dwellings shall be designed to ensure that a maximum of 105 litres of water is consumed per person per day in line with the option requirement of Building Regulations Part G.

T 01795 538527 E enquiries@hawden-mep.co.uk W www.hawden-mep.co.uk

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All showers and baths shall be provided with waste water heat recovery (WWHR).

Dwelling WWHR Heatrae Sadia Megaflo SHRU 60

 Table 3 – Proposed waste water heat recovery

Ventilation

The dwellings shall be provided with independent ventilation systems, comprising of a system 4 centralised heat recovery ventilation system with air being extracted from wet areas and kitchen via a network of ceiling mounted ductwork. Supply air shall be provided to the bedroom and living areas. The ventilation unit shall generally be located within a storage area and be complete with acoustic enclosure to ensure it does not cause nuisance to occupants.

The ventilation unit shall be complete with central controller that shall allow the user to set air flow rates accordingly.

The kitchen areas shall also be provided with recirculation hood, complete with the necessary filtration.

| Dwelling MVHR | Vent Axia Sentinel Kinetic Advance S – Rigid insulated ductwork, approved installation |
|---------------|--|
| | scheme |

 Table 4 – Proposed ventilation systems

Lighting

To maximise the energy efficiency of the lighting, and to help reduce overall building emissions, 100% low energy LED lighting will be selected throughout. There are now very few instances where LED's for this type of installation do not represent the most viable option, and therefore, any consideration for alternatives will need to have a strong argument for justification.

All lighting within the dwellings shall be controlled manually. External lighting shall be controlled automatically, by photocell and timeclock override.

Controls

The controls of the mechanical and electrical systems shall be provided in line with the domestic compliance guide and shall be as follows:

| Heating systems | System controls shall be wired so that when there is no demand for space heating or | | | |
|-----------------|---|--|--|--|
| | hot water, the boiler and pump are switched off; | | | |
| | Dwellings with a total floor area above 150m ² shall have at least two space heating | | | |
| | zones, each with an independently controlled heating circuit; | | | |
| | Dwellings with a total floor area ≤150m ² may have a single space heating zone | | | |
| | Each space heating circuit shall be provided with independent time control and | | | |
| | individual networked radiator controls in each room on the circuit | | | |
| | Where underfloor heating is provided, each room shall be a single heating zone wi | | | |
| | independent on/off time and temperature control. | | | |
| Domestic hot | Domestic hot water circuits shall be supplied instantaneously from the gas fired | | | |
| water systems | combination boiler and should be provided with independent time control and | | | |
| | temperature control. | | | |
| Ventilation | Time control. | | | |

Table 5 – Proposed control systems

Metering

Metering shall be provided to each dwelling, accessible by the occupants to monitor energy usage. Energy meters will be of the smart type.

5.2 Heating Infrastructure – Be Clean

The second step is to 'be clean' by seeking to supply the expected energy demands of a development as cleanly and efficiently as possible. The London Plan requires development proposals to evaluate the feasibility of decentralised energy systems (which may be fed by combined heat and power systems), and where possible to connect to existing district heating networks.

Combined Heat and Power (CHP)

A CHP unit is essentially a type of engine that uses gas to drive the engine which in turn generates electricity and heat. The heat is what is used to provide LTHW, whilst the electricity generated can be fed back into the buildings electrical supply and because of this, with the consequential saving of grid electricity, is classed as a renewable and brings benefits to the Part L energy assessment.

A CHP unit is generally slightly larger than a standalone conventional gas boiler, but not in so much as it would not fit within a conventional plant room. Although CHP is slightly less efficient in terms of gas usage than a conventional gas boiler, the generation of electricity outweighs this small loss in efficiency.

Due to the measures undertaken during the 'Be Lean' stage, the buildings are to be constructed to minimise fabric heat losses, therefore, the heat load for each of the apartments should be relatively low.

A CHP system relies on a constant, large and stable heat load to function at its most efficient and therefore become a viable technology for consideration. Due to the low, intermittent losses, CHP is not considered suitable for integration within this scheme. The carbon savings from CHP are now declining as a result of national grid electricity decarbonizing and there is evidence of adverse air quality impacts.

Heat Network

Currently, there are no existing or planned heat networks in the vicinity of the site, however the site does sit within a heat network priority area, as confirmed on the Mayor of London Heat Map (shown in figure 3 below). London Borough of Bexley Planning Application Requirements states 'that energy assessments need to demonstrate that connection to existing or planned district heating networks, including a future connection to the Riverside Resource Recovery Facility district heating network has been prioritised and should demonstrate that the development is designed to connect to the existing or future district heating network'. The London Heat Map, as of July 2021, does not show any existing or proposed heat networks in the vicinity of the site. The site is also in excess of 2km away from the Riverside Resource Recovery Facility and therefore future connection to the district heat network is unlikely.

The adoption of a building community heating system has been rejected due to loss of accommodation due to an energy centre, requirement of a significant high rise flue in a residential area, infrastructure costs disproportionately high relative to number of units and the maintenance and administration costs for a small scale development represent an excessive service charge to occupants.

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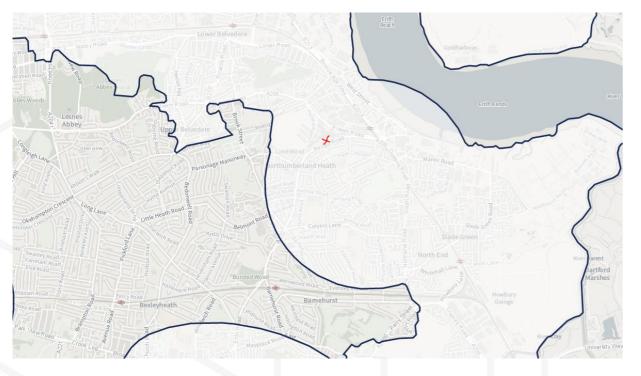


Figure 3 – Extract of London Heat Map

To ensure air quality standards are met any gas boilers to be installed shall be low Nitrogen Oxide (NOx) emitting in accordance with the GLA Appendix 6. Furthermore, this shall be coordinated with the air quality impact assessment or environmental impact assessment for the development where applicable. The following table shows the air quality impacts for the development.

| Energy Source | Total Fuel Consumption (MWh/annum) Residential |
|---------------------------------|--|
| Grid Electricity | 78 |
| Domestic / Communal Gas Boilers | 43 |

Table 6 – Air quality impacts

5.3 Renewable Energy - Be Green

The third step of the hierarchy is to 'be green' by incorporating renewable energy technologies in developments. The Housing SPG states that developers should seek to utilise the following renewable energy technologies that are considered to be technically feasible in London, regardless of whether a 35% target has already been reached through earlier stages of the energy hierarchy:

Biomass

Biomass works in a similar way to a conventional boiler, except the fuel source used is generally wood chip or pellet based. The theory behind this type of system is that the CO_2 generated by the burning of the fuel, is offset by the 'plant matter' growing and absorbing CO_2 before it is cut down and turned into the chipping/pellet fuel. Again, this system does constitute as a renewable as the generated CO_2 is offset as described above and in fact, due to the carbon offset, is one of the best performing renewable alternatives available. Although this seems unlikely compared with for example an ASHP/GSHP that does not produce any CO_2 on site, these other options however run on grid electricity that is generally considered to be a 'dirty' alternative in the Part L energy assessment due to the 'embedded' CO_2 emitted from the power station generating the grid electricity.

Biomass systems have been rejected due to loss of accommodation for the provision of an energy centre, requirement of a significant high rise flue in a residential area, infrastructure costs disproportionately high relative to number of units and the maintenance and administration costs for a small scale development represent an excessive service charge to occupants.

Photovoltaics (PV)

Photovoltaics have a number of benefits, in that in terms of incorporating a renewable option, they can often be very competitive on cost against other methods. Additionally, as long as planning permits, and the site conditions are favorable, they are generally easily accommodated on the roof of the buildings they are serving. Additionally, PV panels are very low maintenance, and have a good life expectancy when compared to other technologies, which make them very popular where renewables are required. Against popular belief, PV will still work on cloudy days, though with much reduced efficiency.

Photovoltaic panels are proposed to maximise on-site renewable energy generation and further offset the development CO_2 emissions. The total photovoltaic array applied to the development is 4.95kWp (equating to an average of 0.3kWp per apartment). Figure 4 below shows the proposed PV layout facing south-east at an inclination of 30° mounted on the flat roof.

The London Plan states 'that all developments maximise opportunities for on-site electricity and heat production from solar technologies (photovoltaic and thermal) and use innovative building materials and smart technologies.' It is therefore recommended to provide photovoltaics at roof level.

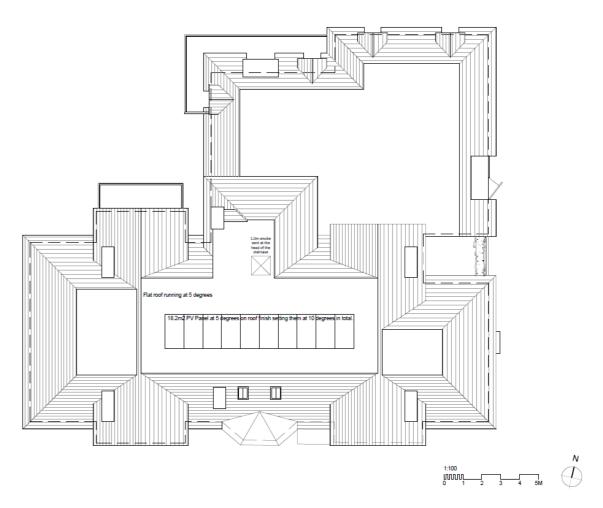


Figure 4 – Extract of Urban and Rural drawing A1353-108

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The area surrounding the proposed development is predominantly 2-storey dwellings, therefore, the proposed PV installation on the third-floor roof level shall not be subject to solar shading and reduced outputs, see Figure 5 and 6 below for further details.



Figure 5 – Extract of Urban and Rural drawing B1353-111

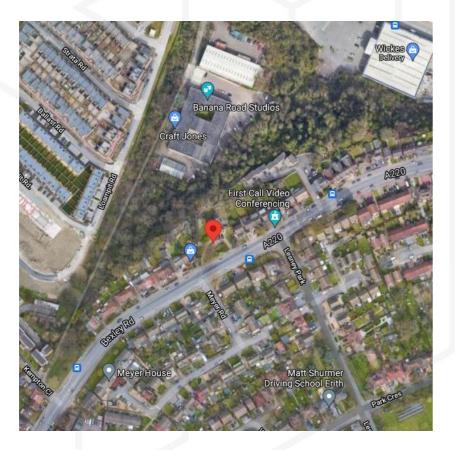


Figure 6 – Site location

Solar water heating

Solar water heating utilise solar thermal panels, capturing solar energy and transferring this to a thermal store to generate domestic hot water and to displace the demand on the heating plant. The peak periods for the solar thermal systems to operate are during the summer period. Solar water heating has been discounted due to the lack of an energy centre to integrate the systems into. Also, roof space has been prioritised for photovoltaics.

Wind

Wind turbines use the force of the wind to drive a rotor and generator to produce electricity. In order to yield high electrical output, wind turbines require consistent air speeds and smooth laminar wind flow. Where wind flow is turbulent, a wind turbine will not operate effectively.

Monitoring of wind turbines in urban and suburban locations has shown in practice that the outputs can be greatly reduced by local wind turbulence effects, leading to low electricity generation and low CO_2 savings. Factors to consider in addition to the above are visual impact on the surroundings, noise, flicker and the impact on birds and bats.

Wind turbines have been rejected due to the potential nuisance to neighboring properties and the presence of existing trees that will affect turbine performance.

Air source heat pump (ASHP)

An ASHP works by converting heat within the air, on a refrigerant cycle, to generate low temperature hot water and could have worked particularly well here especially as ASHP's are generally well suited where the LTHW generated by the ASHP is used to feed an underfloor heating system as proposed here as underfloor heating systems generally run at much lower temperatures than a traditional wet radiator system. An ASHP is classified as a renewable and therefore would help reduce CO₂ emissions, which ultimately reduce the burden on other elements for improvements such as U-Values, other MEP services and/or renewables.

However, the ASHP unit itself needs to be situated externally, and dependent on size, can take up sizeable space. Often in residential apartment buildings, the ground space immediately around the building is often used for private external areas and shared gardens, meaning the ASHP cannot be located at ground level. The ASHP can of course be located at roof level, but this then becomes an aesthetic and/or maintenance consideration. Being situated externally, there is also the potential for noise, and although generally the units are not particularly noisy (generally on a par with an external air conditioning unit), they will always contribute noise that will be noticed by more people than other plant hidden away within an internal plant room.

The ASHPs do require an electrical supply that, depending on the size of the unit, can put a sizeable extra burden on the electricity supply. Lastly, as the ASHP works by drawing heat from the air, there are large temperature fluctuations over the course of the year and therefore the efficiency of the system differs between summer and winter. On the coldest parts of the year, the heat drawn from the air may be insufficient to meet the demand load and therefore additional heat generation may be required from another source which may actually necessitate a small gas supply to a gas boiler to provide top up when the ASHP is unable to perform optimally.

Ground source heat pump (GSHP)

A GSHP works in a similar fashion to an ASHP, but instead of taking heat from the air, the pump works by removing heat from the ground. This is achieved by burying a number of loop coils, and these can either be vertical or horizontal loops. The end result is very similar to an ASHP in that LTHW is generated, which again is particularly suitable for underfloor heating systems, with the same benefits of no gas supply required and the GSHP being classified as a renewable. Additional benefits are that the ground temperature remains relatively stable throughout the year, with minimal fluctuations, and therefore the system is easier to set up and modulate. Finally, unlike the ASHP, the plant is generally housed internally, normally within the plant room.

Again, the GSHP is not without its drawbacks and these can be more significant than the ASHP option. A GSHP that utilises horizontal loops for example, require a lot of land for the loops to be installed in and unless the site has access to this land, often negates the use of this technology. Apart from the fundamental issue of lack of space, the other stumbling block to implementing this technology here is cost, as generally there is a disproportionately large up-front capital cost when compared to other options.

The second option is to use a GSHP in conjunction with vertical bore hole drive loops, with these loops typically installed to depths anywhere in the region of 10m-25m+ depth dependent on the size of the system. This system

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has benefits over the horizontal loop solution as the complete system can be installed within footprint of the building. However, as with the horizontal loop system, the main drawback is the significant up-front capital cost when compared to other options.

GSHP has been discounted due to the lack of an energy centre to integrate the systems into.

Conclusion

Based upon the technologies noted above, we would recommend the use of roof mounted photovoltaics combined with a gas boiler. The assessment of carbon dioxide emissions in the following section incorporates these proposed technologies within the 'Be Green' stage. Details of the input data for the photovoltaic and gas boilers are shown in the table below.

| Gas boilers | Worcester Bosch Greenstar 32CDi Compact ErP condensing gas combination boiler with an annual seasonal efficiency of 89.8% - installed complete with Worcester Bosch Greenstar Xtra flue gas heat recovery unit and Worcester Bosch Sense II weather compensator |
|---------------|--|
| Photovoltaics | 4.95kWp (11No. 450Wp output PV panels), high efficiency panels, 30° tilt, south facing orientation, PV output goes to all apartments in proportion to floor area. |

Table 7 - Proposed technologies

5.4 Monitor Usage - Be Seen

The final step of the hierarchy is 'be seen', which requires developments to verify and report on energy performance. This can be met through the provision of smart meters however the guidance also requests that a plan for monitoring and annual reporting of energy demand and carbon emissions post construction. To meet the final step of the hierarchy, the following is proposed.

Metering

Metering shall be provided to each dwelling, accessible by the occupants to monitor energy usage. Energy meters will be of the smart type.

Monitoring and Expected Costs

The London Plan requests a plan for monitoring and annual reporting of energy demand and carbon emissions post construction, however as these are residential dwellings with independent utility supplies there is no ability to enforce this. It is proposed to provide smart metering, which should allow the occupants to review their past usage (dependent on the energy supplier) and also include information within the homeowner manual on how to record and report energy usage.

The following benchmarks should be included within the homeowner manual for comparison purposes:

| Unit/Plot | Energy | Energy | Energy cost | Energy Cost | Carbon | CO ₂ |
|-----------|-------------|-------------|-------------|-------------|-------------|------------------------|
| No. | Source | Consumption | (p/kWh) | (£/annum) | Factor | Emssions |
| | | (kWh/annum) | | | (kgCO2/kWh) | (kg |
| | | | | | | CO ₂ /year) |
| 1 | Electricity | 4954 | 21.4 | 1060 | 0.233 | 1154 |
| | Gas | 2402 | 4.09 | 98 | 0.21 | 504 |
| 2 | Electricity | 4464 | 21.4 | 955 | 0.233 | 1040 |
| | Gas | 561 | 4.09 | 23 | 0.21 | 118 |
| 3 | Electricity | 5569 | 21.4 | 1192 | 0.233 | 1298 |
| | Gas | 699 | 4.09 | 29 | 0.21 | 147 |
| 4 | Electricity | 4464 | 21.4 | 955 | 0.233 | 1040 |
| | Gas | 561 | 4.09 | 23 | 0.21 | 118 |
| 5 | Electricity | 4464 | 21.4 | 955 | 0.233 | 1040 |
| | Gas | 561 | 4.09 | 23 | 0.21 | 118 |
| 6 | Electricity | 4063 | 21.4 | 869 | 0.233 | 947 |
| | Gas | 425 | 4.09 | 17 | 0.21 | 89 |
| 7 | Electricity | 4464 | 21.4 | 955 | 0.233 | 1040 |
| | Gas | 2595 | 4.09 | 106 | 0.21 | 545 |
| 8 | Electricity | 3695 | 21.4 | 791 | 0.233 | 861 |
| | Gas | 387 | 4.09 | 16 | 0.21 | 81 |
| 9 | Electricity | 4472 | 21.4 | 957 | 0.233 | 1042 |
| | Gas | 562 | 4.09 | 23 | 0.21 | 118 |
| 10 | Electricity | 4823 | 21.4 | 1032 | 0.233 | 1124 |
| | Gas | 606 | 4.09 | 25 | 0.21 | 127 |
| 11 | Electricity | 5240 | 21.4 | 1121 | 0.233 | 1221 |
| | Gas | 658 | 4.09 | 27 | 0.21 | 138 |
| 12 | Electricity | 4472 | 21.4 | 957 | 0.233 | 1042 |
| | Gas | 562 | 4.09 | 23 | 0.21 | 118 |
| 13 | Electricity | 4505 | 21.4 | 964 | 0.233 | 1050 |
| | Gas | 472 | 4.09 | 19 | 0.21 | 99 |
| 14 | Electricity | 8699 | 21.4 | 1862 | 0.233 | 2027 |
| | Gas | 4757 | 4.09 | 195 | 0.21 | 999 |
| 15 | Electricity | 5439 | 21.4 | 1164 | 0.233 | 1267 |
| | Gas | 570 | 4.09 | 23 | 0.21 | 120 |
| 16 | Electricity | 5064 | 21.4 | 1084 | 0.233 | 1180 |
| | Gas | 530 | 4.09 | 22 | 0.21 | 111 |

Table 8 – Expected Costs and Carbon Emissions

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HAWDEN ENGINEERING MEP SOLUTIONS



All Dwellings

ASSESSMENT OF CARBON DIOXIDE EMISSIONS - DWELLINGS

The carbon dioxide emissions at each stage are shown in tables GLA table 1 and 2 and the associated graph below. These indicate that the passive design measures achieve a saving of 37% relative to the baseline. There is no saving associated with the 'Be Clean' stage due to heat networks and CHP technologies not being suitable for the site. Finally, the integration of photovoltaics provides a 6% saving relative to the 'Be Clean' stage.

| | | Carbon dioxide emis buildings (Tonnes | |
|---|---|--|-------------|
| | | Regulated | Unregulated |
| Baseline: Part L 2013 of the Building Regulations Compliant | Α | 17 | 70 |
| Development | | | |
| After energy demand reduction | В | 11 | |
| After heat network/CHP | С | 11 | |
| After renewable energy | D | 10 | |

GLA Table 1 - Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

| | | Regulated domestic carbon diox savings | |
|---|------------------|--|-----|
| | | (Tonnes CO ₂ per annum) | (%) |
| Savings from energy demand reduction | A-B | 6 | 37 |
| Savings from heat network/CHP | B-C | 0 | 0 |
| Savings from renewable energy | C-D | 1 | 6 |
| Cumulative on-site savings | A-D=E | 7 | 42 |
| Annual Savings from off-set payment | A-E=F | 10 | |
| | | (Tonnes CO ₂) | |
| Development's Service Life (30 years) CO ₂ Emissions | F x 30 years = G | 297 | |
| | | (£) | |
| Offset payment per tonne | Н | £60 | |
| Contribution to the Councils Carbon Offset Fund (COF) | GxH | £17,825 | |

GLA Table 2 - Regulated carbon dioxide savings from each stage of the Energy Hierarchy for domestic buildings

Note that the figures in the table above have been taken directly from the GLA Carbon Emission Report Spreadsheet, where they have been rounded up or down accordingly.

The cumulative savings provide a total carbon dioxide saving of 42%, which exceeds the 35% reduction of Part L 2013 as set out by the Mayor's London Plan. The scheme will need to "offset" any remaining CO₂ emissions between 42% and 100% through a financial contribution to the Council's Carbon Offset Fund (COF) which equates to £1800 per tonne (assumed 30-year lifetime of the developments services multiplied by the carbon dioxide offset price). The total contribution to the COF is £17,825.

A summary of the modelling work output is provided within the appendix.

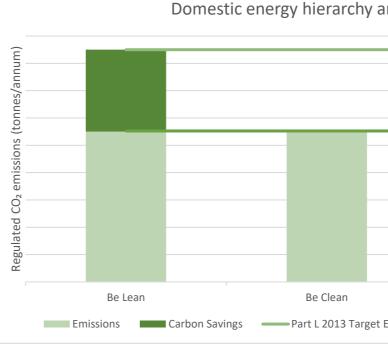


Figure 6 – Dwelling energy hierarchy and targets

Zero Carbon

As part of the requirements in London Plan, Policy SI 2 requests that proposals are made explaining how the site has been future proofed to achieve zero-carbon on-site emissions by 2050.

Indicative economic life expectancies of the proposed mechanical and electrical systems are noted in the table below:

| Equipment | Economic life/ye |
|-----------------------|------------------|
| Pipework | 40-50 |
| Boiler | 10 |
| Radiators/towel rails | 20 |
| Underfloor Heating | 30 |
| Extract fans | 15 |
| Ductwork | 15 |
| Light fittings | 20 |
| Cabling | 25 + |
| | |

Table 9 – Plant Life Expectancy

As indicated in the table above, the majority of systems will be beyond their economic life and likely to have been replaced by 2050. The only exceptions are the pipework, underfloor heating and the cabling systems. The use of underfloor heating will allow the occupants to provide either heat pump or hydrogen boilers when the proposed heat source is beyond its economic life, without major disruptions.

The proposed Worcester Bosch boilers are also ready for the expected national natural gas/hydrogen blend network modification

Note that it is recommended to review the boiler selection prior to the procurement to ensure that any specified equipment is suitable for use with the proposed hydrogen/natural gas changeover.

T 01795 538527 E enquiries@hawden-mep.co.uk W www.hawden-mep.co.uk

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| nd targets | | |
|---------------|---------------|-------|
| | | |
| | | |
| | | |
| | | |
| | | |
| 1 | | |
| | Be Green | |
| Emission Rate | London Plan T | arget |

| ears | |
|------|--|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |



It has also been proposed to allow for a future plant room in the event that heat networks have been extended to a suitable position for connection to the site in the future.

Overheating calculations (see Section 7 Cooling and Overheating) have been undertaken using 2050 weather files.

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7. COOLING AND OVERHEATING

In accordance with Policy SI 4 of the London Plan, measures are to be incorporated to reduce the demand for cooling. The cooling hierarchy is as follows:

Minimising internal heat generation through energy efficient design

Energy efficient measures shall be as per the 'Be Lean' sections above. One of the more important aspects is the provision of highly efficient LED lighting throughout the dwellings. Power densities of the lighting shall be extremely low. Coupled with daylight zoning to perimeter zones, heat gains from services equipment should be minimal.

Reducing amount of heat entering the building in summer

Double glazed windows, complete with low G-values shall be provided throughout the new development to minimise solar gains. Additional solar films shall be added where deemed appropriate.

Due to the nature of the buildings, it is expected that blinds are to be added to all rooms.

Use of thermal mass and high ceilings to manage the heat within the building

The height of the building is restricted to the architect's proposals and therefore the use of high ceilings to manage heat gains is unavailable.

Passive ventilation

Although the domestic areas shall be predominantly ventilated by mechanical means, all windows shall be openable to limit overheating further and glazing mounted trickle ventilators shall be provided to ensure sufficient make-up air.

Mechanical ventilation

Continuous mechanical extract ventilation shall be provided to ensure sufficient air movement within each apartment in accordance with Approved Document Part F.

Overheating risk analysis – Domestic Dwellings

The SAP Assessment documents are within the appendix of this document. The SAP documents outline any dwellings which are at risk of overheating, in line with Criterion 3 of Part L1A.

SAP Assessment calculations produced as part of this report show solar gains are within acceptable limits.

Supplementary planning guidance encourages developers to undertake dynamic modelling to assess the risk of overheating in their development. Such an assessment is an expectation of Policy SI 4 Managing Heat Risk of the London Plan.

A TM59 overheating study utilising 2050 weather files has been carried out for the development using IES Virtual Environment dynamic modelling software. Apartments 15 and 16 on the second floor were chosen due to its south facing position. Apartment 12 on the first floor was also modelled. The assessment passed with the previously mentioned uvalues, sash windows, no blinds and windows open during the night.

Compliance is based upon passing both of the following two criteria:

- a. For living rooms, kitchen and bedrooms: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance);
- b. For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10pm to 7am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32hours, so 33 or more hours above 26°C will be recorded as a fail).

A summary of the results is shown in the table below:

| 1 | ~ |
|---|---|
| | - |
| | |
| 5 | _ |
| | K |

| Unit/Plot No. | Room | CIBSE TM52 Criterion 1: Hours of exceedance | Hours above 26°C (between 10pm and 7am) |
|------------------|-----------------------|--|--|
| 12 | Lounge/Dining/Kitchen | 0 | n/a |
| | Double Bedroom | 0 | 0 |
| | Single Bedroom | 0 | 0 |
| 15 | Lounge/Dining/Kitchen | 0.5 | n/a |
| | Double Bedroom | 0 | 11 |
| 16 | Lounge/Dining/Kitchen | 0.6 | n/a |
| | Double Bedroom | 0 | 11 |

Table 10 – Overheating Analysis

(T) 01795 538527 (E) enquiries@hawden-mep.co.uk (W) www.hawden-mep.co.uk

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8. APPENDICES

T 01795 538527 E enquiries@hawden-mep.co.uk W www.hawden-mep.co.uk

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Regulations Compliance Report

| Printed on 15 July 2 | 2021 at 16:05:45 | , England assessed by St | roma FSAP 2012 program, Ve | rsion: 1.0.5.41 | |
|---|---|---|---|--------------------|----------------|
| Project Information | n: | | | | |
| Assessed By: | () | | Building Type: | Flat | |
| Dwelling Details: | | | | | |
| NEW DWELLING | DESIGN STAGE | | Total Floor Area: 6 | 67.3m ² | |
| Site Reference : | 106 Bexley Road | | Plot Reference: | Unit 1 - 1B 2P | - Be Green |
| Address : | 106 Bexley Road , | Erith, DA8 3SP | | | |
| Client Details: | | | | | |
| Name: | Kang | | | | |
| Address : | Upna Ltd , 106 Be | kley Road , Erith , DA8 3S | P | | |
| - | s items included wi e report of regulati | thin the SAP calculation ons compliance. | IS. | | |
| 1a TER and DER | | | | | |
| | ng system: Mains ga | IS | | | |
| Fuel factor: 1.00 (m | iains gas) kide Emission Rate (| (TER) | 17.08 kg/m² | | |
| - | ioxide Emission Rate | . , | 9.67 kg/m ² | | ок |
| 1b TFEE and DFE | | | | | |
| - | gy Efficiency (TFEE) | | 39.4 kWh/m² | | |
| Dwelling Fabric Ene | ergy Efficiency (DFE | :E) | 31.0 kWh/m ² | | ОК |
| 2 Fabric U-values | | | | | UK |
| Element External w Party wall Floor | /all | Average 0.16 (max. 0.30) 0.00 (max. 0.20) 0.11 (max. 0.25) | Highest 0.16 (max. 0.70) - 0.11 (max. 0.70) | | ок ок ок |
| Roof | | (no roof) | 0.11 (max. 0.10) | | ON |
| Openings | | 1.16 (max. 2.00) | 1.20 (max. 3.30) | _ | ОК |
| 2a Thermal bridg | ing | | | | |
| Thermal b 3 Air permeability | | om linear thermal transmi | ttances for each junction | | |
| | ility at 50 pascals | | 4.00 (design val 10.0 | ue) | ок |
| 4 Heating efficier | псу | | | | |
| Main Heating | g system: | Database: (rev 479, pro Boiler systems with radi Brand name: Worcester Model: Greenstar Model qualifier: 32CDi C (Combi) Efficiency 89.8 % SEDB Minimum 88.0 % | ators or underfloor heating - ma Compact ErP | ains gas | ОК |
| Secondary h | neating system: | None | | | |

Regulations Compliance Report

| ylinder insulation | | | |
|--|--|--------------------|----|
| Hot water Storage: | No cylinder | | |
| ontrols | | | |
| Space heating controls Hot water controls: | TTZC by plumbing and el No cylinder thermostat No cylinder | lectrical services | ок |
| Boiler interlock: | Yes | | ОК |
| ow energy lights | | | |
| Percentage of fixed lights with lo Minimum | w-energy fittings | 100.0% 75.0% | ОК |
| echanical ventilation | | | |
| Continuous supply and extract s Specific fan power: | ystem | 0.39 | |
| Maximum | | 1.5 | OK |
| MVHR efficiency: | | 93% | |
| Minimum | | 70% | OK |
| ummertime temperature | | | |
| Overheating risk (South East En | gland): | Slight | OK |
| ed on: | | | |
| Overshading: | | Average or unknown | |
| Windows facing: South | | 1.31m ² | |
| Windows facing: South | | 1.69m ² | |
| Windows facing: South | | 5.37m ² | |
| Ventilation rate: | | 3.00 | |
| Blinds/curtains: | | None | |
| Key features | | | |
| Thermal bridging | | 0.035 W/m²K | |
| Doors U-value | | 1 W/m²K | |
| Party Walls U-value | | 0 W/m²K | |
| Floors U-value | | 0.11 W/m²K | |
| Photovoltaic array | | | |

SAP Input

Property Details: Unit 1 - 1B 2P - Be Green

| Address: Located in: | 106 Bexley Road , Erith , DA8 3SP England |
|-----------------------------------|--|
| Region: | South East England |
| UPRN: | - |
| Date of assessment: | 13 July 2021 |
| Date of certificate: | 15 July 2021 |
| Assessment type: | New dwelling design stage |
| Transaction type: | New dwelling |
| Tenure type: | Unknown |
| Related party disclosure: | No related party |
| Thermal Mass Parameter: | Indicative Value Medium |
| Water use <= 125 litres/person/da | ay: True |
| PCDF Version: | 479 |

| Property description | า: | | | | | | | |
|----------------------------------|----------------|---------------------|----------------------------|----------------|---------------------------------|----------------|--------------------|-------------|
| Dwelling type: Detachment: | | Flat | | | | | | |
| Year Completed: | | 2021 | | | | | | |
| Floor Location: | | Floor a | area: | | | | | |
| | | | | | Storey height | : | | |
| Basement floor | _ | 67.3 m ² | | | 2.7 m | | | |
| Living area: | | 29.9 m ² | (fraction 0.444) |) | | | | |
| Front of dwelling f | aces: | South | | | | | | |
| Opening types: | | | | | | | | |
| Name: | Source: | Ту | pe: | Glazing: | | Argon: | Fram | e: |
| Fron <mark>t Door</mark> | Manufacturer | So | lid | | | Ŭ | W <mark>ood</mark> | |
| Sout <mark>h Win</mark> dow | SAP 2012 | | ndows | | = 0.0 <mark>5, soft</mark> coat | Yes | PVC-U | |
| South Window 2 | SAP 2012 | | ndows | | 0.05, soft coat | Yes | PVC-U | |
| South Window 3 | SAP 2012 | VVI | ndows | IOW-E, EN = | 0.05, soft coat | Yes | PVC-U | |
| Name: | Gap: | | Frame Facto | or: g-value: | U-value: | Area: | No. o | f Openings: |
| Front Door | mm | | 0.7 | 0 | 1 | 1.91 | 1 | |
| South Window | 16mm or | | 0.7 | 0.63 | 1.2 | 1.31 | 1 | |
| South Window 2 South Window 3 | 16mm or | | 0.7 0.7 | 0.63 0.63 | 1.2 1.2 | 1.69 5.37 | 1 1 | |
| South window 3 | 16mm or | more | 0.7 | 0.03 | 1.2 | 5.57 | I | |
| Name: | Type-Name | e: La | cation: | Orient: | | Width: | Heigl | nt: |
| Front Door | | | ternal Wall | North | | 0.91 | 2.1 | |
| South Window | | | ternal Wall | South | | 0.69 | 1.9 | |
| South Window 2 South Window 3 | | | ternal Wall ternal Wall | South South | | 0.9 2.3 | 1.875 2.335 | |
| | | LX | | South | | 2.3 | 2.335 | |
| Overshading: | | Average | e or unknown | | | | | |
| Opaque Elements: | | ritoluge | | | | | | |
| | | | | | | | | |
| 51 | Gross area: | Openings: | Net area: | U-value: | Ru value: | Curtain | wall: | Kappa: |
| External Elements | 41.01 | 10.00 | 21.02 | 0.1/ | 0 | Eal | | N1 / A |
| External Wall Corridor Wall | 41.31 16.74 | 10.28 0 | 31.03 16.74 | 0.16 0.16 | 0 0.4 | False False | | N/A N/A |
| External Floor | 67.3 | U | 10.74 | 0.10 | 0.4 | 1 0130 | | N/A |
| Internal Elements | 0 | | | | | | | |
| Party Elements | | | | | | | | |
| Party Wall | 45.36 | | | | | | | N/A |
| Party Ceiling | 67.3 | | | | | | | N/A |

SAP Input

| Thormal bridges: | Llear dofin | ad (individual [| 201_values | Y-Value = 0.0353 |
|--|--|---|--|--|
| Thermal bridges: | Length | Psi-valu | | 1 - value = 0.0353 |
| [Approved] | 4.865 | 0.3 | E2 | Other lintels (including other steel lintels) |
| [Approved] | 1.59 | 0.04 | E3 | Sill |
| [Approved] | 16.47 | 0.05 | E4 | Jamb |
| [Approved] | 16.8 | 0.06 | E18 | Party wall between dwellings |
| [, , , , , , , , , , , , , , , , , , , | 15.3 | 0.07 | E22 | Basement floor |
| Ventilation: | | | | |
| Pressure test: | Yes (As de | signed) | | |
| Ventilation: | Balanced v Number of Ductwork: | vith heat recov wet rooms: Ki Insulation, rigi | itchen + 1 id | |
| Number of chimneys: | 0 | | | |
| Number of open flues: | 0 | | | |
| Number of fans: | 0 | | | |
| Number of passive stacks: | 0 | | | |
| Number of sides sheltered: | 3 | | | |
| Pressure test: | 4 | | | |
| Main heating system: | · | | | |
| Main heating system: | Boiler syste | ems with radia | tors or und | lerfloor heating |
| Main heating Control: | Fuel: main Info Sourc Database: Brand nam Model: Gre Model qua (Combi boi Systems w Central hea Design flow Unknown Boiler inter Weather C | e: Boiler Datab (rev 479, prod e: Worcester eenstar ifier: 32CDi Co ler) ith radiators ating pump : 2 v temperature: lock: Yes ompensator | oase uct index (ompact ErP 013 or late : Design flo | |
| Vain heating Control: | services | emperature zo | | by suitable an angement of plumbing and electrical |
| | Control cod | de: 2110 | | |
| Secondary heating system: | | | | |
| Secondary heating system: | None | | | |
| Water heating: | | | | |
| Water heating: | From main | heating syster | m | |
| 3 | Water code | | | |
| | Fuel :main | | | |
| | | ter cylinder | | |
| | | eat Recovery S | System: | |
| | | (rev 479, proc | | 060039) |
| | | | | |
| | | me: Alpha | | |
| | | • | | |
| | Brand na Model: In | • | 0GS+GasSa | aver-GS-1 |

SAP Input

Total rooms with shower and/or bath: 1 Product index: 080106, Megaflo SHRU 60 System B Number of mixer showers in rooms with a bath: 1 Number of mixer showers in rooms without a bath: 0 Solar panel: False

Others:

Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics: Standard Tariff Unknown No conservatory 100% Low rise urban / suburban English No <u>Photovoltaic 1</u> Installed Peak power: 0.3 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:



| User Details: | | | | | | | | | | | |
|--|-------------------------------|--------------------------|------------|------------------------------|-------------|------------------|-----------------------|----------------|-----------------------------------|---------------------|--|
| Assessor Name: Software Name: | Stroma FSAP 201 | | | Stroma Softwa Address: | re Ver | sion: | Be Gre | | n: 1.0.5.41 | | |
| Address : | 106 Bexley Road , I | | | 1001033. | | | DC OIC | CIT | | | |
| 1. Overall dwelling dime | • | | 0001 | | | | | | | | |
| Basement | | | - | a(m²) 67.3 | (1a) x | r | ight(m) 2.7 | (2a) = | Volume(m ³) 181.71 | (3a) | |
| Total floor area TFA = (1a | a)+(1b)+(1c)+(1d)+(1e | e)+(1n |) 6 | 67.3 | (4) | | | | | | |
| Dwelling volume | | | | | (3a)+(3b) | +(3c)+(3d | l)+(3e)+ | .(3n) = | 181.71 | (5) | |
| 2. Ventilation rate: | | | | _ | | _ | | | | | |
| Number of chimneys | heating h | econdary neating 0 |] + [| 0 0 |] = [| total 0 | | 40 = | m ³ per hour | (6a) | |
| Number of open flues | 0 + | 0 | + | 0 |] = [| 0 | X 2 | 20 = | 0 | (6b) | |
| Number of intermittent fai | ns | | | | | 0 | x ^ | 10 = | 0 | (7a) | |
| Number of passive vents | | | | | Γ | 0 | x ´ | 10 = | 0 | (7b) | |
| Number of flueless gas fir | res | | | | Ē | 0 | X 4 | 40 = Air ch | 0 ange <mark>s per</mark> hou | (7c) | |
| Infiltration due to chimney | | | | | ontinue fro | 0 om (9) to (| | ÷ (5) = | 0 | (8) | |
| Number of storeys in th Additional infiltration Structural infiltration: 0. | e dw <mark>elling</mark> (ns) | | | | | | | -1]x0.1 = | 0 | (9) (10) (11) | |
| if both types of wall are pr deducting areas of openin If suspended wooden fl | | | - | | | | | | | - | |
| If no draught lobby, ent | | | i (seale | u), eise | | | | | 0 | (12) (13) | |
| Percentage of windows | | ripped | | | | | | | 0 | (13) | |
| Window infiltration | | nppou | | 0.25 - [0.2 | x (14) ÷ 1 | 00] = | | | 0 | (15) | |
| Infiltration rate | | | | (8) + (10) · | + (11) + (1 | 2) + (13) + | + (15) = | | 0 | (16) | |
| Air permeability value, | q50, expressed in cub | oic metres | s per ho | our per so | quare m | etre of e | nvelope | area | 4 | (17) | |
| If based on air permeabili | ty value, then (18) = [(1 | 7) ÷ 20]+(8 |), otherwi | se (18) = (| 16) | | | · | 0.2 | (18) | |
| Air permeability value applies | | s been don | e or a deg | ree air pei | meability i | is being us | sed | | | - | |
| Number of sides sheltere | d | | | (20) = 1 - [| 0 075 v (1 | 0)1 - | | | 3 | (19) | |
| Shelter factor | ing chalter factor | | | (20) = (18) | | 9)] = | | | 0.78 | (20) | |
| Infiltration rate incorporati | - | J | | (21) = (10) | x (20) - | | | | 0.16 | (21) | |
| Infiltration rate modified fo | Mar Apr May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | | |
| | | | Jui | Aug | Oep | 001 | | Dec | | | |
| Monthly average wind spo (22)m= 5.1 5 | 4.9 4.4 4.3 | 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 | | | |
| | II | | 0.0 | 0.7 | т | 1.0 | 1.0 | T. / | | | |
| Wind Factor $(22a)m = (22a)m $ | 2)m ÷ 4 1.23 1.1 1.08 | 0.95 | 0.95 | 0.92 | 1 | 1.08 | 1.12 | 1.18 | | | |
| | I | II | | | | | I | | | | |

| Adjust | ed infiltr | ation rat | e (allowi | ing for sh | nelter an | d wind s | peed) = | (21a) x | (22a)m | - | | | _ | |
|---------------|------------|-------------------------|---------------|--------------|--------------|----------------|-------------|----------------|-------------|-----------------------|-------------|-----------|----------|---------------|
| • • • | 0.2 | 0.19 | 0.19 | 0.17 | 0.17 | 0.15 | 0.15 | 0.14 | 0.16 | 0.17 | 0.17 | 0.18 | | |
| | | al ventila | • | rate for t | ne appli | cable ca | se | | | | | | 0.5 | (23a) |
| | | | | endix N, (2 | (23a) = (23a | ı) × Fmv (e | equation (N | N5)) . othei | wise (23b |) = (23a) | | | 0.5 | |
| | | | | iency in % | | | | | | , , , | | | 79.0 | |
| | | | - | - | - | | | | | 2b)m + (2 | 23b) x [1 | – (23c) | | 5 (200) |
| (24a)m= | r | 0.3 | 0.29 | 0.28 | 0.27 | 0.25 | 0.25 | 0.25 | 0.26 | 0.27 | 0.28 | 0.29 |] | (24a) |
| b) If | balance | d mecha | anical ve | entilation | without | heat rec | covery (N | и ЛV) (24b |)m = (22 | 2b)m + (2 | 23b) | | 1 | |
| (24b)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (24b) |
| c) If | whole h | ouse ex | tract ver | tilation of | or positiv | e input v | ventilatio | n from c | outside | | | | | |
| | if (22b)n | n < 0.5 × | (23b), t | then (24 | c) = (23b |); otherv | wise (24 | c) = (22b | o) m + 0. | 5 × (23b |) | | | |
| (24c)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | J | (24c) |
| , | | | | ole hous | • | • | | | | 0 51 | | | | |
| | r – – – | n = 1, tn | en (24d) 0 | m = (221 | o)m otne | erwise (2 | (4a)m = 0 | 0.5 + [(2 | 2b)m² x | 0.5 | 0 | 0 | 1 | (24d) |
| (24d)m= | _ | | - | | | | | | - | 0 | 0 | 0 | J | (240) |
| ⊂ne (25)m= | 0.3 | 0.3 | 0.29 | nter (24a | 0.27 | 0.25 | 0.25 | 0.25 | 0.26 | 0.27 | 0.28 | 0.29 |] | (25) |
| (20)11- | 0.0 | 0.0 | 0.20 | 0.20 | 0.21 | 0.20 | 0.20 | 0.20 | 0.20 | 0.21 | 0.20 | 0.20 | | () |
| | | | | paramet | | | | | | _ | | | | |
| ELEN | | Gros area | | Openin | | Net Ar A ,n | | U-valı W/m2 | | A X U (W/ł | <) | k-value | | A X k kJ/K |
| Doors | | aroa | () | | | 1.91 | x | 1 | = | 1.91 | - | 110/111 | | (26) |
| Windo | ws Type | e 1 | | | | 1.31 | | /[1/(1.2)+ | 0.04] = | 1.5 | Ħ | | | (27) |
| | ws Type | | | | | 1.69 | | /[1/(1.2)+ | Ļ | 1.94 | Ħ | | | (27) |
| | ws Type | | | | | 5.37 | | /[1/(1.2)+ | L | 6.15 | 4 | | | (27) |
| Floor | - 71 | | | | | 67.3 | | 0.11 | = [| 7.403 | = г | | | (28) |
| Walls | Type1 | 41.3 | 11 | 10.2 | 8 | 31.03 | | 0.16 | | 4.96 | ╡╞ | | \dashv | (29) |
| | Type2 | 16.7 | | 0 | | 16.74 | | 0.15 | | 2.52 | ╡╞ | | \dashv | (29) |
| | | lements | | | | 125.3 | | 0.10 | [| 2.02 | | | | (31) |
| Party | | | , | | | 45.36 | | 0 | = [| 0 | | | | (32) |
| Party | | | | | | 67.3 | | 0 | [| 0 | | | \dashv | (32b) |
| | - | roof wind | ows, use e | effective wi | indow U-va | | | formula 1 | /[(1/U-valu | ıe)+0.04] a | s given in | paragraph | | (020) |
| | | | | nternal wal | | | 0 | | | , <u> </u> | 0 | , , , | | |
| Fabric | heat los | s, W/K : | = S (A x | U) | | | | (26)(30) | + (32) = | | | | 26.3 | 8 (33) |
| Heat c | apacity | Cm = S(| (Axk) | | | | | | ((28) | (30) + (32 | 2) + (32a). | (32e) = | 17755 | 5.5 (34) |
| Therm | al mass | parame | ter (TMI | - Cm - | ÷ TFA) ir | ∩ kJ/m²K | | | Indica | tive Value: | Medium | | 250 | (35) |
| | • | sments wh ad of a de | | | constructi | ion are not | t known pr | ecisely the | indicative | e values of | TMP in Te | able 1f | | |
| Therm | al bridg | es : S (L | x Y) cal | culated | using Ap | pendix ł | < | | | | | | 4.43 | 3 (36) |
| | | | are not kr | nown (36) = | = 0.05 x (3 | 1) | | | | (00) | | | | |
| | abric he | | | marth | ., | | | | | (36) = | | | 30.8 | 3 (37) |
| ventila | r | i | i | | | 1 | 11 | ۸ | | $= 0.33 \times (100)$ | | | 1 | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |

| (38)m= | 18.13 | 17.9 | 17.67 | 16.51 | 16.27 | 15.11 | 15.11 | 14.88 | 15.58 | 16.27 | 16.74 | 17.2 | | (38) |
|--|----------------------|-----------------------|----------------------|------------------|----------------|------------------|-----------------|------------------|-----------------|---------------------------|------------------------|-----------------|-----------------------|------|
| Heat tr | ansfer o | coefficie | nt, W/K | | | | | | (39)m | = (37) + (3 | - 38)m | | | |
| (39)m= | 48.94 | 48.7 | 48.47 | 47.31 | 47.08 | 45.92 | 45.92 | 45.68 | 46.38 | 47.08 | 47.54 | 48.01 | | |
| Heat lo | ss para | ameter (I | HLP), W | /m²K | | | | | | Average = = (39)m ÷ | | 12 /12= | 47.25 | (39) |
| (40)m= | 0.73 | 0.72 | 0.72 | 0.7 | 0.7 | 0.68 | 0.68 | 0.68 | 0.69 | 0.7 | 0.71 | 0.71 | | |
| | | | | | | | | | | Average = | Sum(40)1. | 12 /12= | 0.7 | (40) |
| Numbe | - | /s in mo Feb | nth (Tab Mar | , 1 | Max | lun | Jul | Aug | San | Oct | Nov | Dec | | |
| (41)m= | Jan 31 | 28 | 31 | Apr 30 | May 31 | Jun 30 | 31 | Aug 31 | Sep 30 | 31 | 30 | 31 | | (41) |
| (, | 0. | | | | | | | | | | | | | , |
| 4. Wa | ter hea | ting ene | rgy requ | irement: | | | | | | | | kWh/ye | ar: | |
| A | | | NI | | | | | | | | | | | |
| if TF. | A > 13. | | + 1.76 x | [1 - exp | (-0.0003 | 849 x (TF | -A -13.9) |)2)] + 0.0 | 0013 x (| TFA -13. | | 18 | | (42) |
| | | 9, N = 1 1e hot w: | ater usag | ne in litre | es per da | av Vd av | erage = | (25 x N) | + 36 | | 85 | .95 | | (43) |
| Reduce | the annua | al average | hot water | usage by | 5% if the a | lwelling is | designed t | | | se target o | | .95 | | (40) |
| not more | e that 125 | | person per | | | | | | | _ | | | | |
| Hot wate | Jan ar usage i | Feb | Mar r day for ea | Apr Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| | 94.54 | 91.1 | 87.67 | 84.23 | 80.79 | 77.35 | 77.35 | 80.79 | 84.23 | 87.67 | 91.1 | 94.54 | | |
| (44)m= | 94.04 | 91.1 | 07.07 | 04.25 | 00.79 | 11.55 | 11.55 | 00.79 | | | | | 1031.37 | (44) |
| $Total = Sum(44)_{112} = 1031.37 $ (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) | | | | | | | | | | | | | | |
| (45)m= | 140.2 | 122.62 | 126.54 | 110.32 | 105.85 | 91.34 | 84.64 | 97.13 | 98.29 | 114.54 | 125.03 | 135.78 | | |
| lf instant | aneous v | vater heati | ng at point | of use (no | hot water | storage). | enter 0 in | boxes (46 | | Tota <mark>l = S</mark> u | m(45) ₁₁₂ = | - | 1 <mark>352.29</mark> | (45) |
| (46)m= | 21.03 | 18.39 | 18.98 | 16.55 | 15.88 | 13.7 | 12.7 | 14.57 | 14.74 | 17.18 | 18.76 | 20.37 | | (46) |
| | storage | | 10.00 | 10.00 | 10.00 | 10.7 | 12.1 | 14.07 | 14.74 | 11.10 | 10.70 | 20.07 | | () |
| Storage | e volum | ne (litres) |) includir | ng any so | olar or W | /WHRS | storage | within sa | ame ves | sel | | 0 | | (47) |
| | • | - | and no ta | | - | | | . , | ` | (0) : (| 47) | | | |
| | ise it no storage | | hot wate | er (this ir | iciudes i | nstantar | ieous co | indi dan | ers) ente | er 'O' in (| 47) | | | |
| | • | | eclared I | oss facto | or is kno | wn (kWł | n/day): | | | | | 0 | | (48) |
| Tempe | rature f | actor fro | m Table | 2b | | | | | | | | 0 | | (49) |
| | | | r storage | • | | | | (48) x (49) |) = | | | 0 | | (50) |
| , | | | eclared of factor fr | • | | | | | | | | | | (51) |
| | | - | see secti | | | | ly) | | | | | 0 | | (51) |
| | • | from Ta | | | | | | | | | | 0 | | (52) |
| Tempe | rature f | actor fro | m Table | 2b | | | | | | | | 0 | | (53) |
| | | | r storage | e, kWh/y€ | ear | | | (47) x (51) | x (52) x (| 53) = | | 0 | | (54) |
| | . , | (54) in (8 | | for acab | month | | | ((56)~ (| 55) - (44) | m | | 0 | | (55) |
| | - | | culated | | | | | ((56)m = (| | 1 | | | | |
| (56)m= If cylinde | 0 er contain | 0 s dedicate | 0 d solar sto | 0 rage, (57)i | 0 n = (56)m | 0 x [(50) – (| 0 H11)] ÷ (5 | 0 0), else (5 | 0 7)m = (56) | 0 m where (| 0 H11) is fro | 0 m Appendix | άH | (56) |
| (57)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | (57) |
| (57)11= | U | | | | 0 | 0 | U | U | U | | 0 | Ŭ | | (07) |

| Primary circu Primary circu | | , | | | (50)m - (| (59) · 26 | $S = \sqrt{41}$ | m | | | 0 |] | (58) |
|--------------------------------|--------------------------|-----------|----------------|-------------------------|--------------------|--------------------------|-----------------|-------------|--------------------------|-------------------|-------------|---------------|------------|
| (modified) | | | | | . , . | . , | , | | r thermo | stat) | | | |
| (59)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (59) |
| Combi loss d | alculated | for each | ب ۱ month (| (61)m = | (60) ÷ 3€ | 35 × (41) |)m | | <u> </u> | | 1 | I | |
| (61)m= 24.91 | 22.5 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | | (61) |
| Total heat re | quired for | water h | eating ca | alculatec | for each | n month | (62)m = | 0.85 × (| (45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= 165.1 | 2 145.13 | 151.45 | 134.43 | 130.77 | 115.45 | 109.56 | 122.04 | 122.4 | 139.46 | 149.14 | 160.69 | | (62) |
| Solar DHW inpu | it calculated | using App | endix G or | Appendix | H (negativ | ve quantity | /) (enter '0' | if no sola | r contributi | ion to wate | er heating) | | |
| (add additior | nal lines if | FGHRS | and/or V | NWHRS | applies. | , see Ap | pendix G | 3) | | - | | | |
| (63)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| FHRS 13.01 | 9.82 | 8.78 | 6.76 | 6.16 | 5.3 | 5.01 | 5.68 | 5.73 | 6.94 | 9.43 | 13.09 | | (63) (G2) |
| WWHRS -31.2 | 7 -27.51 | -28.08 | -23.12 | -21.48 | -17.72 | -15.01 | -18.17 | -18.7 | -23.1 | -26.74 | -30.22 | | (63) (G10) |
| Output from | water hea | iter | | | | | | | | | - | | |
| (64)m= 119.9 | 3 106.97 | 113.68 | 103.67 | 102.22 | 91.55 | 88.62 | 97.28 | 97.09 | 108.51 | 112.09 | 116.48 | | - |
| | | | | | | | Outp | ut from wa | ater heater | r (annual)₁ | 12 | 1258.11 | (64) |
| Heat gains fi | om water | heating | , kWh/ma | onth 0.2 | 5´[0.85 | × (45)m | + (61)m |] + 0.8 > | < [(46)m | + (57)m | + (59)m |] | |
| (65)m= 52.85 | 6 46.4 | 48.3 | 42.71 | 41.42 | 36.4 | 34.37 | 38.52 | 38.71 | 44.31 | 47.6 | 51.38 | | (65) |
| in <mark>clude</mark> (5 | 7)m in c <mark>al</mark> | culation | of (65)m | only i <mark>f</mark> c | ylinder is | s in th <mark>e c</mark> | dwelling | or hot w | ate <mark>r is fr</mark> | om com | munity h | eating | |
| 5. Internal | gains (see | e Table 8 | 5 and 5a |): | | | | | | | | | |
| Met <mark>abolic</mark> ga | ins (Table | e 5), Wat | tts | | | | | | | | | | |
| Jan | Feb | Mar | Apr | Мау | Jun | Jul – | Aug | Sep | Oct | Nov | Dec | | |
| (66)m= 130.7 | 3 130.73 | 130.73 | 130.73 | 130.73 | 130.73 | 130.73 | 130.73 | 130.73 | 1 <mark>3</mark> 0.73 | 130.73 | 130.73 | | (66) |
| Lighting gair | s (calcula | ted in A | ppendix I | L, equat | ion L9 or | . L9a), a' | lso see | Table 5 | _ | - | <u>.</u> | - | |
| (67)m= 46.86 | 6 41.62 | 33.85 | 25.62 | 19.15 | 16.17 | 17.47 | 22.71 | 30.48 | 38.71 | 45.18 | 48.16 | | (67) |
| Appliances g | | | | | | - | - | | | | | | |
| (68)m= 284.9 | 5 287.9 | 280.45 | 264.59 | 244.57 | 225.75 | 213.17 | 210.22 | 217.67 | 233.53 | 253.56 | 272.38 | | (68) |
| Cooking gair | ns (calcula | ated in A | .ppendix | L, equat | tion L15 | or L15a) | , also se | e Table | 5 | | | | |
| (69)m= 50.25 | 5 50.25 | 50.25 | 50.25 | 50.25 | 50.25 | 50.25 | 50.25 | 50.25 | 50.25 | 50.25 | 50.25 | | (69) |
| Pumps and f | ans gains | (Table | 5a) | | <u> </u> | | | | | | | | |
| (70)m= 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | (70) |
| Losses e.g. | evaporatio | on (nega | tive valu | es) (Tab | le 5) | | | | | - | | | |
| (71)m= -87.1 | 5 -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | | (71) |
| Water heatin | lg gains (⊺ | Table 5) | | | | | - | | | | | | |
| (72)m= 71.03 | 69.04 | 64.92 | 59.32 | 55.68 | 50.55 | 46.2 | 51.78 | 53.76 | 59.56 | 66.11 | 69.05 | | (72) |
| Total intern | al gains = | : | | | (66) | m + (67)m | ı + (68)m + | · (69)m + | (70)m + (7 | 1)m + (72) |)m | | |
| (73)m= 499.6 | 6 495.4 | 476.05 | 446.36 | 416.23 | 389.3 | 373.67 | 381.54 | 398.74 | 428.63 | 461.67 | 486.42 | | (73) |
| 6. Solar gai | ns: | | | | | | | | | | | | |
| <u> </u> | | | | | | | | | | | | | |
| Solar gains an Orientation: | e calculated | - | ar flux from | Table 6a | and associ Flux | | tions to co | nvert to th | e applicab | le orientat FF | tion. | Gains | |

| South | 0.9x | 0.77 | x | 1.31 | x | 46.75 | × | 0.63 | x | 0.7 | = | 18.72 | (78) |
|---------------------|------|------|---|------|---|--------|---|------|---|-----|---|---------------------|------|
| South | 0.9x | 0.77 | x | 1.69 | x | 46.75 | x | 0.63 | x | 0.7 | = | 24.15 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 46.75 | x | 0.63 | x | 0.7 | = | 76.73 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 76.57 | x | 0.63 | x | 0.7 | = | 30.65 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 76.57 | x | 0.63 | x | 0.7 | = | 39.55 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 76.57 | x | 0.63 | x | 0.7 | = | 125.66 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 97.53 | × | 0.63 | x | 0.7 | = | 39.05 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 97.53 | x | 0.63 | x | 0.7 | = | 50.37 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 97.53 | x | 0.63 | x | 0.7 | = | 160.07 | (78) |
| South | 0.9x | 0.77 | × | 1.31 | x | 110.23 | × | 0.63 | x | 0.7 | = | 44.13 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 110.23 | x | 0.63 | x | 0.7 | = | 56.93 | (78) |
| South | 0.9x | 0.77 | × | 5.37 | x | 110.23 | × | 0.63 | x | 0.7 | = | 180.91 | (78) |
| South | 0.9x | 0.77 | × | 1.31 | x | 114.87 | x | 0.63 | x | 0.7 | = | 45.99 | (78) |
| South | 0.9x | 0.77 | × | 1.69 | x | 114.87 | x | 0.63 | x | 0.7 | = | 59.33 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 114.87 | x | 0.63 | x | 0.7 | = | 188.52 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 110.55 | x | 0.63 | x | 0.7 | = | 44.26 | (78) |
| South | 0.9x | 0.77 | × | 1.69 | x | 110.55 | x | 0.63 | x | 0.7 | = | 57.1 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 110.55 | х | 0.63 | х | 0.7 | = | 181.42 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 108.01 | x | 0.63 | x | 0.7 | = | 43.24 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 108.01 | × | 0.63 | x | 0.7 | = | 55.79 | (78) |
| Sout <mark>h</mark> | 0.9x | 0.77 | x | 5.37 | x | 108.01 | x | 0.63 | x | 0.7 | = | 177.26 | (78) |
| Sout <mark>h</mark> | 0.9x | 0.77 | × | 1.31 | x | 104.89 | x | 0.63 | x | 0.7 | = | 41.99 | (78) |
| South | 0.9x | 0.77 | × | 1.69 | x | 104.89 | × | 0.63 | x | 0.7 | = | <mark>5</mark> 4.18 | (78) |
| Sout <mark>h</mark> | 0.9x | 0.77 | x | 5.37 | x | 104.89 | x | 0.63 | x | 0.7 | = | 172.15 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 101.89 | x | 0.63 | x | 0.7 | = | 40.79 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 101.89 | x | 0.63 | x | 0.7 | = | 52.62 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 101.89 | x | 0.63 | x | 0.7 | = | 167.21 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 82.59 | x | 0.63 | x | 0.7 | = | 33.06 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 82.59 | x | 0.63 | x | 0.7 | = | 42.65 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 82.59 | x | 0.63 | x | 0.7 | = | 135.53 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 55.42 | x | 0.63 | x | 0.7 | = | 22.19 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 55.42 | x | 0.63 | x | 0.7 | = | 28.62 | (78) |
| South | 0.9x | 0.77 | × | 5.37 | x | 55.42 | × | 0.63 | x | 0.7 | = | 90.95 | (78) |
| South | 0.9x | 0.77 | × | 1.31 | × | 40.4 | × | 0.63 | x | 0.7 | = | 16.17 | (78) |
| South | 0.9x | 0.77 | × | 1.69 | × | 40.4 | × | 0.63 | x | 0.7 | = | 20.87 | (78) |
| South | 0.9x | 0.77 | × | 5.37 | x | 40.4 | × | 0.63 | x | 0.7 | = | 66.3 | (78) |
| | | | | | | | | | | | | | |

| Solar g | ains in | watts, ca | alculated | l for eacl | n month | | | (83)m = S | um(74)m . | (82)m | | | | |
|---|--|---------------------|------------|------------|-------------|-----------|----------------------|-----------|-----------|--------|--------|--------|--------|------|
| (83)m= | 119.59 | 195.86 | 249.49 | 281.98 | 293.84 | 282.78 | 276.29 | 268.32 | 260.62 | 211.25 | 141.76 | 103.34 | | (83) |
| Total g | ains – ii | nternal a | nd solar | (84)m = | = (73)m - | + (83)m | , watts | | | | | | ' | |
| (84)m= | 4)m= 619.25 691.25 725.54 728.34 710.07 672.08 649.97 649.86 659.36 639.88 603.43 589.75 | | | | | | | | | | | | | (84) |
| 7. Mean internal temperature (heating season) | | | | | | | | | | | | | | |
| Temp | erature | during h | eating p | eriods ir | n the livir | ng area f | from Tab | ole 9, Th | 1 (°C) | | | | 21 | (85) |
| Utilisa | ation fac | tor for g | ains for l | iving are | ea, h1,m | (see Ta | ble 9a) | | | | | | | |
| Stroma I | SAP 201 | 2 v Ersio n: | 1.0.9.44 | SAP 9.52 | - http://ww | vw.stroma | .com ^l ul | Aug | Sep | Oct | Nov | Dec | Page 5 | of 8 |

| | | | | - | | i | | | | | | | | |
|----------|---------------|-----------|---------------------|--------------------|-------------------|--------------------------|-------------------|--------------------|-------------------|---|----------------------------------|--------------------------------|------------------------|-------|
| (86)m= | 0.97 | 0.93 | 0.87 | 0.75 | 0.61 | 0.44 | 0.31 | 0.32 | 0.48 | 0.74 | 0.92 | 0.97 | | (86) |
| Mean | interna | l temper | ature in | living ar | ea T1 (fe | ollow ste | ps 3 to 7 | 7 in Tabl | e 9c) | | | | | |
| (87)m= | 20.67 | 20.78 | 20.89 | 20.97 | 20.99 | 21 | 21 | 21 | 21 | 20.97 | 20.84 | 20.65 | | (87) |
| Temp | erature | durina h | neating p | eriods i | n rest of | dwelling | from Ta | able 9. T | h2 (°C) | | | | | |
| (88)m= | 20.32 | 20.32 | 20.32 | 20.34 | 20.34 | 20.36 | 20.36 | 20.36 | 20.35 | 20.34 | 20.34 | 20.33 | | (88) |
| Litilion | tion for | tor for a | aine for | roct of d | wolling | h2,m (se | | . () () | | | | | 1 | |
| (89)m= | 0.96 | 0.91 | 0.84 | 0.72 | 0.57 | 0.39 | 0.27 | 0.28 | 0.44 | 0.7 | 0.9 | 0.97 | 1 | (89) |
| | | | | | | | | | | | 0.0 | 0.07 | J | (00) |
| | | <u> </u> | r | r | r | ing T2 (f | 1 | r – | r | <u>, </u> | r | | l | |
| (90)m= | 19.89 | 20.06 | 20.19 | 20.3 | 20.34 | 20.36 | 20.36 | 20.36 | 20.35 | 20.32 | 20.14 | 19.87 | | (90) |
| | | | | | | | | | T | ila = Livin | g area ÷ (4 | 4) = | 0.44 | (91) |
| Mean | interna | l temper | ature (fo | or the wh | ole dwe | lling) = f | LA x T1 | + (1 – fL | A) × T2 | _ | | | | |
| (92)m= | 20.24 | 20.38 | 20.5 | 20.6 | 20.63 | 20.64 | 20.64 | 20.64 | 20.64 | 20.61 | 20.45 | 20.22 | | (92) |
| Apply | adjustr | nent to t | he mear | n interna | l temper | ature fro | m Table | e 4e, whe | ere appro | opriate | - | - | | |
| (93)m= | 20.24 | 20.38 | 20.5 | 20.6 | 20.63 | 20.64 | 20.64 | 20.64 | 20.64 | 20.61 | 20.45 | 20.22 | | (93) |
| 8. Spa | ace hea | ting requ | uirement | | | | | | | | | | | |
| | | | | | | ned at st | ep 11 of | Table 9 | o, so tha | t Ti,m=(| 76)m an | d re-calc | ulate | |
| the ut | ilisation | | or gains | | I | | | | i | | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| | | | ains, hm | | | | | | | | | | | (0.1) |
| (94)m= | 0.96 | 0.92 | 0.85 | 0.73 | 0.59 | 0.41 | 0.29 | 0.3 | 0.46 | 0.72 | 0.9 | 0.96 | | (94) |
| | | | , W = (94 | · · · | | 077.00 | 405.0 | 400.07 | 000.04 | 450.04 | 5 45 00 | 500 7 | | (05) |
| (95)m= | 591.98 | 632.82 | 616.67 | 535.13 | 417.11 | 277.26 | 185.6 | 193.87 | 302.84 | 45 <mark>8.21</mark> | 545.63 | 568.7 | l i | (95) |
| | 11y avera | age exte | 6.5 | 8.9 | 11.7 | 14.6 | 16.6 | 16.4 | 14.1 | 10.6 | 7.1 | 4.2 | | (96) |
| (96)m= | - | | | | | | | | | | 7.1 | 4.2 | | (90) |
| | 779.93 | 753.93 | an intern 678.72 | 553.4 | erature, 420.3 | Lm , W = | =[(39)m 185.61 | x [(93)m 193.88 | - (96)m 303.25 | 471.21 | 634.83 | 768.94 | | (97) |
| (97)m= | | | | | | | | | | | | 700.94 | l | (37) |
| (98)m= | 139.84 | 81.38 | 46.17 | 13.16 | 2.38 | Wh/mon ⁻ 0 | 11 = 0.02 | 24 X [(97 |)m – (95 0 | 9.67 | 64.22 | 148.98 | 1 | |
| (50)11- | 100.04 | 01.00 | 40.17 | 10.10 | 2.00 | Ů | Ŭ | | | |) = Sum(9 | | 505.8 | (98) |
| _ | | | | | | | | TOLA | i per year | (KWII/yeai |) = Sum(9 | O) _{15,912} = | 505.8 | |
| Space | e heatin | g require | ement in | kWh/m ² | ²/year | | | | | | | | 7.52 | (99) |
| 9a. En | ergy rec | quiremer | nts – Indi | ividual h | eating s | ystems i | ncluding | j micro-C | CHP) | | | | | |
| - | e heatir | - | | | | | | | | | | | | _ |
| Fracti | on of sp | bace hea | at from s | econdar | y/supple | ementary | system | | | | | | 0 | (201) |
| Fracti | on of sp | bace hea | at from m | nain syst | tem(s) | | | (202) = 1 | - (201) = | | | | 1 | (202) |
| Fracti | on of to | tal heati | ng from | main sy | stem 1 | | | (204) = (2 | 02) × [1 – | (203)] = | | | 1 | (204) |
| Efficie | ency of I | main spa | ace heat | ing syste | em 1 | | | | | | | | 93.7 | (206) |
| Efficie | encv of s | seconda | rv/suppl | ementar | v heatin | g systen | า. % | | | | | | 0 | (208) |
| | • | | · · · | i | - | 1 | | A | Car | Oct | Next | Dee | | |
| Snoo | Jan beatin | Feb | Mar ement (c | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | kWh/y | eai |
| opace | 139.84 | 81.38 | 46.17 | 13.16 | 2.38 | 0 | 0 | 0 | 0 | 9.67 | 64.22 | 148.98 | | |
| (044) | | | | | | L Ŭ | Ľ | Ľ | Ŭ | 0.07 | VT.LL | 1 10.00 | l | (044) |
| (211)m | | í | (4)] } x 1 | i i | 1 | | | | 0 | 10.00 | 60 F 4 | 450 | 1 | (211) |
| | 149.24 | 86.85 | 49.27 | 14.04 | 2.53 | 0 | 0 | | | 10.32 | 68.54 211) _{15.1012} | 159 | F GG G (| |
| | | | | | | | | TOTA | ii (rivvii/yee | uin(2 | - · · / _{15,10} 12 | - | 539.81 | (211) |

Space heating fuel (secondary), kWh/month

| = {[(98)m x (201)] } x 100 ÷ | - (208) | | | | | | | | | | |
|--|------------------------------|------------|------------------|------------|------------|------------|------------------------|---------------------------------|---------------------|-----------------------|--------|
| (215)m= 0 0 (| 0 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | _ |
| | | | | | Tota | l (kWh/yea | ar) =Sum(2 | 2 15) _{15,1012} | 2 | 0 | (215) |
| Water heating | | | | | | | | | | | |
| Output from water heater (119.93 106.97 113 | 2.68 103.67 | 102.22 | 91.55 | 88.62 | 97.28 | 97.09 | 108.51 | 112.09 | 116.48 |] | |
| Efficiency of water heater | | | | | I | | | | | 87.2 | (216) |
| (217)m= 89.05 88.68 88 | .18 87.58 | 87.28 | 87.2 | 87.2 | 87.2 | 87.2 | 87.48 | 88.44 | 89.13 | | (217) |
| Fuel for water heating, kW $(219)m = (64)m \times 100 \div (219)m$ | | | | - | - | - | | - | | _ | |
| | 3.92 118.37 | 117.12 | 104.99 | 101.63 | 111.56 | 111.34 | 124.05 | 126.74 | 130.68 | | |
| | | | | - | Tota | I = Sum(2' | 19a) ₁₁₂ = | - | - | 1430.72 | (219) |
| Annual totals | | 4 | | | | | k | Wh/year | | kWh/year | 1 |
| Space heating fuel used, n | nain system | 1 | | | | | | | | 539.81 |] |
| Water heating fuel used | | | | | | | | | | 1430.72 | |
| Electricity for pumps, fans | and electric | keep-hot | | | | | | | | _ | |
| mechanical ventilation - b | alanced, ext | ract or po | ositive ii | nput fror | n outside | Э | | | 108.07 | | (230a) |
| central heating pump: | | | | | | | | | 30 | | (230c) |
| boiler with a fan-assisted | flue | | | | | | | | 45 | | (230e) |
| Total electricity for the abo | ve, <mark>kWh/</mark> yea | r | | | sum | of (230a). | <mark>(2</mark> 30g) = | | | 183.07 | (231) |
| Electricity for lighting | | | | | | | | | | 331 | (232) |
| Electricity generated by PV | /s | | | | | | | | | -2 <mark>59.09</mark> | (233) |
| Total delivered energy for | all u <mark>ses (</mark> 211 |)(221) | + (231) | + (232) | (237b) | _ | | | | 2225.51 | (338) |
| 10a. Fuel costs - individua | al heating sy | stems: | | | | | | | | | - |
| | | | Fu | el | | | Fuel P | rice | | Fuel Cost | |
| | | | kΜ | /h/year | | | (Table | 12) | | £/year | |
| Space heating - main syste | em 1 | | (217 | 1) x | | | 3.4 | 8 | x 0.01 = | 18.79 | (240) |
| Space heating - main syste | em 2 | | (213 | 3) x | | | 0 | | x 0.01 = | 0 | (241) |
| Space heating - secondary | , | | (21 | 5) x | | | 13. | 19 | x 0.01 = | 0 | (242) |
| Water heating cost (other f | uel) | | (219 | 9) | | | 3.4 | 8 | x 0.01 = | 49.79 | (247) |
| Pumps, fans and electric k | eep-hot | | (23) | 1) | | | 13. | 19 | x 0.01 = | 24.15 | (249) |
| (if off-peak tariff, list each of Energy for lighting | of (230a) to (| 230g) se | parately (232 | | licable a | nd apply | r fuel pri 13. | | ding to x 0.01 = | Table 12a 43.66 | (250) |
| Additional standing charge | s (Table 12) | | | | | | | | | 120 | (251) |
| | | | one | of (233) t | o (235) x) | | 13. | 19 | x 0.01 = | 0 | (252) |
| Appendix Q items: repeat I | ines (253) a | nd (254) : | as need | ded | | | | | | | - |
| Total energy cost | · · / | . , | | 50)(254) | = | | | | | 256.38 | (255) |
| 11a SAP rating - individu | al heating ev | ictome | | | | | | | | | |

| Energy cost deflator (Table 12) | | | 0.42 (256) |
|---|-------------------------------|-------------------------------|---------------------------------|
| Energy cost factor (ECF) [(2 | 55) x (256)] ÷ [(4) + 45.0] = | | 0.96 (257) |
| SAP rating (Section 12) | | | 86.62 (258) |
| 12a. CO2 emissions – Individual heating s | ystems including micro-CHP | | |
| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
| Space heating (main system 1) | (211) x | 0.216 = | 116.6 (261) |
| Space heating (secondary) | (215) x | 0.519 = | 0 (263) |
| Water heating | (219) x | 0.216 = | 309.04 (264) |
| Space and water heating | (261) + (262) + (263) + (26 | 4) = | 425.63 (265) |
| Electricity for pumps, fans and electric keep | o-hot (231) x | 0.519 = | 95.01 (267) |
| Electricity for lighting | (232) x | 0.519 = | 171.79 (268) |
| Energy saving/generation technologies Item 1 | | 0.519 = | -134.47 (269) |
| Total CO2, kg/year | | sum of (265)(271) = | 557.97 (272) |
| CO2 emissions per m ² | | (272) ÷ (4) = | 8.29 (273) |
| El rating (section 14) | | | 93 (274) |
| 13a. Primary Energy | | | |
| Space heating (main system 1) | Energy kWh/year (211) x | Primary factor | P. Energy kWh/year |
| Space heating (secondary) | (215) × | 3.07 = | 0 (263) |
| Energy for water heating | (219) x | 1.22 = | 1745.48 (264) |
| Space and water heating | (261) + (262) + (263) + (26 | | 2404.04 (265) |
| Electricity for pumps, fans and electric keep | o-hot (231) x | 3.07 = | 562.03 (267) |
| Electricity for lighting | (232) x | 0 = | 1016.18 (268) |
| Energy saving/generation technologies Item 1 | | 3.07 = | -795.39 (269) |
| 'Total Primary Energy | | sum of (265)(271) = | 3186.85 (272) |
| Primary energy kWh/m²/year | | (272) ÷ (4) = | 47.35 (273) |

| | | | User D | etails: | | | | | | |
|---|--|--------------------------|--------------|------------------|------------------------|-------------|-----------------------|-----------|-----------------------------------|--------------|
| Assessor Name: Software Name: | Stroma FSAP 201 | | | Stroma Softwa | ire Ver | sion: | · Be Gre | | n: 1.0.5.41 | |
| Address : | 106 Bexley Road , | | | Address. | Unit I - | | De Gle | en | | |
| 1. Overall dwelling dimen | | | 0 335 | | | | | | | |
| Basement | | | Area 6 | | (1a) x | | ight(m) 2.7 | (2a) = | Volume(m ³) 181.71 | (3a) |
| Total floor area TFA = (1a) | +(1b)+(1c)+(1d)+(1e | e)+(1n |) 6 | 7.3 | (4) | | | | | |
| Dwelling volume | | | | | (3a)+(3b) | +(3c)+(3d | l)+(3e)+ | .(3n) = | 181.71 | (5) |
| 2. Ventilation rate: | - | | | | | | | | | |
| Number of chimneys | | econdary neating 0 | , + | other 0 |] = [| total 0 | X 4 | 40 = | m ³ per hour | (6a) |
| Number of open flues | 0 + | 0 | + | 0 | = | 0 | x 2 | 20 = | 0 | (6b) |
| Number of intermittent fan | S | | | | | 0 | x ´ | 10 = | 0 | (7a) |
| Number of passive vents | | | | | Ē | 0 | x ′ | 10 = | 0 | (7b) |
| Number of flueless gas fire | es | | | | Ē | 0 | X 4 | 40 = | 0 | (7c) |
| | | | | | | | | Air ch | anges per ho | ur |
| Infiltration due to chimneys | | | | | | 0 | | ÷ (5) = | 0 | (8) |
| If a pressurisation test has be | | ed, proceed | l to (17), c | otherwise c | ontinue fro | om (9) to (| (16) | | | |
| Number of storeys in the Additional infiltration | e aweiling (ns) | | | | | | [(0). | -1]x0.1 = | 0 | (9) (10) |
| Structural infiltration: 0.2 | 5 for steel or timber | frame or | 0.35 for | masonr | v constr | uction | [(0) | 1,00.1 - | 0 | (10) |
| if both types of wall are pre deducting areas of opening | sent, use the value corres s); if equal user 0.35 | sponding to | the greate | er wall area | a (after | | | | | |
| If suspended wooden flo | | led) or 0. | 1 (seale | d), else | enter 0 | | | | 0 | (12) |
| If no draught lobby, ente | | | | | | | | | 0 | (13) |
| Percentage of windows | and doors draught s | tripped | | 0.25 - [0.2 | $\mathbf{v}(14) \pm 1$ | 001 - | | | 0 | (14) |
| Window infiltration Infiltration rate | | | | (8) + (10) - | · · · | - C | + (15) - | · | 0 | (15) |
| Air permeability value, q | 50 expressed in cut | nic metres | | | | | | area | 0 4 | (16) (17) |
| If based on air permeabilit | • | | • | • | • | | invelope | uluu | 0.2 | (17) |
| Air permeability value applies | | | | | | is being us | sed | | 0.2 | |
| Number of sides sheltered | | | | | | | | | 3 | (19) |
| Shelter factor | | | | (20) = 1 - [| | 9)] = | | | 0.78 | (20) |
| Infiltration rate incorporatir | - | | | (21) = (18) | x (20) = | | | | 0.16 | (21) |
| Infiltration rate modified for | | <u> </u> | | | | | 1 | 1 | I | |
| Jan Feb M | lar Apr May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly average wind spe | | , , | | | | | 1 | , | 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 Factor (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 | | |

| Adjust | ed infiltr | ation rat | e (allowi | ing for sh | nelter an | d wind s | peed) = | (21a) x | (22a)m | | | | - | |
|---------------------|--------------------------|----------------------------|----------------|--------------|-------------|----------------|----------------|-----------------|--------------|----------------|------------------|-------------------|------------|---------------|
| ~ / | 0.2 | 0.19 | 0.19 | 0.17 | 0.17 | 0.15 | 0.15 | 0.14 | 0.16 | 0.17 | 0.17 | 0.18 | | |
| | late effec echanica | | • | rate for t | he appli | cable ca | se | | | | | | 0.5 | (23a) |
| | | | | endix N. (2 | 3b) = (23a | i) x Fmv (e | equation (N | N5)) . othe | rwise (23b |) = (23a) | | | 0.5 | (23a) |
| | | | | | allowing f | | | | | , (, | | | 0.5 | |
| | | | | | °, | | `` | | , , | 2h)m + (| 23b) × [1 | I – (23c) | | (230) |
| (24a)m= | | 0.3 | 0.29 | 0.28 | 0.27 | 0.25 | 0.25 | 0.25 | 0.26 | 0.27 | 0.28 | 0.29 |] | (24a) |
| | | d mech: | I anical ve | I | without | heat rec | :overv (N | L /\\/) (24b | l = (22) | I 2b)m + (; | 1 23b) | | 1 | |
| (24b)m | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (24b) |
| c) If | whole h | ouse ex | ract ver | ntilation of | or positiv | re input v | /entilatic | n from c | utside | | | | J | |
| , | | | | | c) = (23b | • | | | | 5 × (23b |)) | | | |
| (24c)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |] | (24c) |
| d) If | | | | | se positiv | • | | | | - | - | - | - | |
| | r , | | r , , | r · | o)m othe | , , | · | <u> </u> | , | <u> </u> | | | 1 | |
| (24d)m= | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24d) |
| | | | | <u> </u> |) or (24b | , <u> </u> | <i>,</i> , | , , | r í | | 1 | | 1 | |
| (25)m= | 0.3 | 0.3 | 0.29 | 0.28 | 0.27 | 0.25 | 0.25 | 0.25 | 0.26 | 0.27 | 0.28 | 0.29 | | (25) |
| 3. He | eat l <mark>osse</mark> | s and he | at loss | paramet | er: | | | | | | | | | |
| ELE | | Gros are <mark>a</mark> | | Openin m | - | Net Ar A ,r | | U-valı W/m2 | | A X U (W/I | K) | k-value kJ/m²- | | A X k kJ/K |
| Doo <mark>rs</mark> | | | | | | 1.91 | x | 1 | = [| 1.91 | | | | (26) |
| Windo | <mark>ws</mark> Type | e 1 | | | | 1.31 | x1/ | /[1/(1.2)+ | 0.04] = | 1.5 | | | | (27) |
| Windc | ws Type | 2 | | | | 1.69 | x1/ | /[1/(1.2)+ | 0.04] = | 1.94 | | | | (27) |
| Windo | ws Type | 93 | | | | 5.37 | x1/ | /[1/(1.2)+ | 0.04] = | 6.15 | 5 | | | (27) |
| Floor | | | | | | 67.3 | x | 0.11 | | 7.403 | Γ | | | (28) |
| Walls | Type1 | 41.3 | 31 | 10.2 | 8 | 31.03 | 3 X | 0.16 | = [| 4.96 | i T | | \dashv | (29) |
| Walls | Type2 | 16.7 | ' 4 | 0 | | 16.74 | × | 0.15 | | 2.52 | | | \exists | (29) |
| | area of e | | | | | 125.3 | | | เ | | L | | | (31) |
| Party | wall | | | | | 45.36 | 5 X | 0 | | 0 | | | | (32) |
| Party | ceiling | | | | | 67.3 | | | I | | | | \exists | (32b) |
| | • | roof wind | ows, use e | effective wi | ndow U-va | | ated using | formula 1 | /[(1/U-valu | ıe)+0.04] a | L as given in | paragraph | L h 3.2 | ` |
| ** inclue | de the area | as on both | sides of ir | nternal wal | ls and part | titions | | | | | | | | |
| | heat los | | | U) | | | | (26)(30) | + (32) = | | | | 26.38 | (33) |
| | capacity | | . , | | | | | | ((28) | (30) + (32 | 2) + (32a). | (32e) = | 17755. | 5 (34) |
| | | • | | | - TFA) in | | | | | tive Value | | | 250 | (35) |
| | ign assess used inste | | | | constructi | ion are not | t known pr | ecisely the | e indicative | e values of | TMP in Ta | able 1f | | |
| Therm | nal bridge | es : S (L | x Y) cal | culated | using Ap | pendix ł | < | | | | | | 4.43 | (36) |
| | | | are not kr | 10wn (36) = | = 0.05 x (3 | 1) | | | (00) | (26) | | | | |
| | abric he | | aloulotor | monthly | | | | | | (36) = | 25)m v (E) | | 30.8 | (37) |
| ventila | | | i | | | lun | [] | A | . , | · · · · | 25)m x (5) | _ | 1 | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |] | |

| (38)m= | 18.13 | 17.9 | 17.67 | 16.51 | 16.27 | 15.11 | 15.11 | 14.88 | 15.58 | 16.27 | 16.74 | 17.2 | | (38) |
|------------|---------------------|------------------------|-------------------------|--------------|-------------|---------------------------------------|------------|-------------------------------------|--------------|------------------------|------------------------|---------------------|---------|--------------|
| Heat tr | ansfer o | coefficie | nt, W/K | | | | | | (39)m | = (37) + (| 38)m | | | |
| (39)m= | 48.94 | 48.7 | 48.47 | 47.31 | 47.08 | 45.92 | 45.92 | 45.68 | 46.38 | 47.08 | 47.54 | 48.01 | | |
| Heatle | ee nara | motor (l | HLP), W | /m2k | | | | | | Average = = (39)m ÷ | Sum(39)1 | 12 /12= | 47.25 | (39) |
| (40)m= | 0.73 | 0.72 | 0.72 | 0.7 | 0.7 | 0.68 | 0.68 | 0.68 | 0.69 | 0.7 | 0.71 | 0.71 | | |
| (- / | | | | | | | | | | | Sum(40)1 | | 0.7 | (40) |
| Numbe | er of day | | nth (Tab | le 1a) | | | | | | 1 | 1 | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | (|
| (41)m= | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | | (41) |
| | | | | | | | | | | | | | | |
| 4. Wa | ter hea | ting ene | rgy requ | irement: | | | | | | | | kWh/ye | ar: | |
| | | upancy, | | •. | | · · · · · · · · · · · · · · · · · · · | | | | / | | .18 | | (42) |
| | | 9, N = 1 9, N = 1 | + 1.76 x | (1 - exp | (-0.0003 | 849 x (TF | -A -13.9 |)2)] + 0.0 | 0013 x (| IFA -13. | .9) | | | |
| Annual | averag | e hot w | ater usa | | | | | | | | | 5.95 | | (43) |
| | | - | hot water person pe | • • | | - | - | to achieve | a water u | se target o | f | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Hot wate | | | r day for ea | | | | | <u> </u> | | 000 | 1407 | | | |
| (44)m= | 9 <mark>4.54</mark> | 91.1 | 87.67 | 84.23 | 80.79 | 77.35 | 77.35 | 80.79 | 84.23 | 87.67 | 91.1 | <mark>9</mark> 4.54 | | |
| | | | | | | | | | | | m(44) ₁₁₂ = | | 1031.37 | (44) |
| Energy o | | | [.] used - cal | | | | | | | | | · · · · · | | |
| (45)m= | 140.2 | 122.62 | 126.54 | 110.32 | 105.85 | 91.34 | 84.64 | 97.13 | 98.29 | 114.54 | 125.03 | 135.78 | 1050.00 | |
| lf instant | aneous v | vater heati | ing at point | t of use (no | o hot water | r storage), | enter 0 in | boxes (46 | | 10tal = 5u | m(45) ₁₁₂ = | = L | 1352.29 | (45) |
| (46)m= | 21.03 | 18.39 | 18.98 | 16.55 | 15.88 | 13.7 | 12.7 | 14.57 | 14.74 | 17.18 | 18.76 | 20.37 | | (46) |
| Water | - | | | | | | | | | | ! | | | |
| 0 | | • |) includir | 0, | | | 0 | | ame ves | sel | | 0 | | (47) |
| | • | • | and no ta hot wate | | • | | | ` ' | ers) ent | er '0' in <i>(</i> | 47) | | | |
| Water | | | not hat | | | notantai | | | | | , | | | |
| a) If m | anufact | urer's d | eclared I | oss facto | or is kno | wn (kWł | n/day): | | | | | 0 | | (48) |
| Tempe | rature f | actor fro | om Table | 2b | | | | | | | | 0 | | (49) |
| | | | r storage | • | | or io pot | | (48) x (49) |) = | | | 0 | | (50) |
| | | | eclared of factor fi | • | | | | | | | | 0 | | (51) |
| | | • | see secti | | , | | | | | | | - | | |
| | | from Ta | | 0 | | | | | | | | 0 | | (52) |
| - | | | om Table | | | | | · · · · · · · · · · · · · · · · · · | | | | 0 | | (53) |
| | | om wate (54) in (\$ | r storage | e, kVVh/ye | ear | | | (47) x (51) |) x (52) x (| 53) = | | 0 | | (54) (55) |
| | . , | . , . | lculated | for each | month | | | ((56)m = (| 55) × (41) | m | L | v | | (33) |
| (56)m= | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (56) |
| | - | - | | - | - | | | - | - | | | om Appendix | ĸН | () |
| (57)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (57) |
| | | | | | | | · | | | | | | | |

| Primary circu | • | , | | | (50) - (| (50) · 26 | SE v (41) | m | | | 0 | | (58) |
|------------------------------|-------------------------|------------------|------------------------|-----------------------|-------------|--------------------------|--------------|---------------|---------------------------|---------------|---------------------|---------------|------------|
| Primary circu (modified b | | | | | . , . | . , | . , | | r thermo | stat) | | | |
| (59)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (59) |
| Combi loss c | alculated | for each | י month (| (61)m = | (60) ÷ 36 | 35 × (41) |)m | | | | | | |
| (61)m= 24.91 | 22.5 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | | (61) |
| Total heat re | quired for | water h | eating ca | alculated | I for each | n month | (62)m = | 0.85 × | (45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= 165.12 | 2 145.13 | 151.45 | 134.43 | 130.77 | 115.45 | 109.56 | 122.04 | 122.4 | 139.46 | 149.14 | 160.69 | | (62) |
| Solar DHW inpu | t calculated | using App | endix G or | ⁻ Appendix | H (negativ | ve quantity | /) (enter '0 | if no sola | r contribut | ion to wate | er heating) | | |
| (add addition | al lines if | FGHRS | and/or V | NWHRS | applies, | , see Ap | pendix C | G) | - | - | - | | |
| (63)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| FHRS 15.98 | 12.35 | 10.71 | 7.57 | 6.36 | 5.3 | 5.01 | 5.68 | 5.73 | 7.71 | 11.9 | 15.96 | | (63) (G2) |
| WWHRS -31.27 | -27.51 | -28.08 | -23.12 | -21.48 | -17.72 | -15.01 | -18.17 | -18.7 | -23.1 | -26.74 | -30.22 | | (63) (G10) |
| Output from | water hea | ıter | | | | | | | _ | | | _ | |
| (64)m= 116.9 | 6 104.44 | 111.76 | 102.86 | 102.02 | 91.55 | 88.62 | 97.28 | 97.09 | 107.74 | 109.62 | 113.61 | | _ |
| | | | | | | | Outp | out from w | ater heate | r (annual)₁ | 12 | 1243.55 | (64) |
| Hea <mark>t gains fr</mark> | om water | heating | , kWh/mo | onth 0.2 | 5 ´ [0.85 | × (45)m | + (61)m | n] + 0.8 x | k [(46)m | + (57)m | + (59)m |] | |
| (65)m= 52.85 | 46.4 | 48.3 | 42.71 | 41.42 | 36.4 | 34.37 | 38.52 | 38.71 | 4 <mark>4.31</mark> | 47.6 | 51.3 <mark>8</mark> | | (65) |
| in <mark>clude</mark> (57 |)m in c <mark>al</mark> | culation | <mark>of (6</mark> 5)m | only if c | ylinder is | s in th <mark>e c</mark> | dwelling | or hot w | ate <mark>r is f</mark> r | om com | munity h | eating | |
| 5. Internal | gains (see | e Table 5 | 5 and 5a) |): | | | | | | | | | |
| Met <mark>abolic</mark> ga | ins (Table | <u>+ 5), Wat</u> | ts | | · · · · · · | | | | | | 1 | | |
| Jan | | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (66)m= 108.94 | 108.94 | 108.94 | 108.94 | 108.94 | 108.94 | 108.94 | 108.94 | 108.94 | 10 <mark>8.94</mark> | 108.94 | 108.94 | | (66) |
| Lighting gain | s (calcula | ted in A | ppendix I | L, equat | ion L9 or | : L9a), a | lso see | Table 5 | i | i | i | | |
| (67)m= 18.74 | 16.65 | 13.54 | 10.25 | 7.66 | 6.47 | 6.99 | 9.08 | 12.19 | 15.48 | 18.07 | 19.26 | | (67) |
| Appliances g | • | | | | | | | | _ | | - | | |
| <mark>(68)</mark> m= 190.92 | 2 192.9 | 187.9 | 177.28 | 163.86 | 151.25 | 142.83 | 140.85 | 145.84 | 156.47 | 169.88 | 182.49 | | (68) |
| Cooking gair | is (calcula | ated in A | ppendix | L, equat | tion L15 | or L15a) |), also se | e Table | 5 | | | | |
| (69)m= 33.89 | 33.89 | 33.89 | 33.89 | 33.89 | 33.89 | 33.89 | 33.89 | 33.89 | 33.89 | 33.89 | 33.89 | | (69) |
| Pumps and f | ans gains | (Table | 5a) | | | | | | | | | | |
| (70)m= 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | (70) |
| Losses e.g. e | evaporatio | on (nega | tive valu | es) (Tab | ole 5) | | | | - | - | - | | |
| (71)m= -87.15 | 5 -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | -87.15 | | (71) |
| Water heatin | g gains (1 | ۲able 5) | | | | | | | | | | | |
| (72)m= 71.03 | 69.04 | 64.92 | 59.32 | 55.68 | 50.55 | 46.2 | 51.78 | 53.76 | 59.56 | 66.11 | 69.05 | | (72) |
| Total interna | al gains = | : | | | (66) | m + (67)m | n + (68)m + | + (69)m + | (70)m + (7 | 1)m + (72) | m | | |
| (73)m= 339.3 | 7 337.27 | 325.05 | 305.52 | 285.88 | 266.96 | 254.7 | 260.39 | 270.48 | 290.19 | 312.75 | 329.49 | | (73) |
| 6. Solar gai | ns: | | | | | | | | | | | | |
| Solar gains are | e calculated | using sola | r flux from | Table 6a a | and associ | ated equa | tions to co | nvert to th | ne applicat | | ion. | | |
| Orientation: | Access F Table 6d | | Area m² | | Flu: Tab | x ole 6a | Т | g_ able 6b | Та | FF able 6c | | Gains (W) | |

| | _ | | | | _ | | | | | | | | _ |
|-------|------|--------------------|-----|------|---|-----------------------|---|------|---|-----|---|--------|------|
| South | 0.9x | 0.77 | x | 1.31 | x | 46.75 | x | 0.63 | x | 0.7 | = | 18.72 | (78) |
| South | 0.9x | 0.77 | × | 1.69 | x | 46.75 | × | 0.63 | x | 0.7 | = | 24.15 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 46.75 | × | 0.63 | x | 0.7 | = | 76.73 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 76.57 | × | 0.63 | x | 0.7 | = | 30.65 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 76.57 | x | 0.63 | x | 0.7 | = | 39.55 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 76.57 | x | 0.63 | x | 0.7 | = | 125.66 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 97.53 | × | 0.63 | x | 0.7 | = | 39.05 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 97.53 | × | 0.63 | x | 0.7 | = | 50.37 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 97.53 | x | 0.63 | x | 0.7 | = | 160.07 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 110.23 | × | 0.63 | x | 0.7 | = | 44.13 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 110.23 | × | 0.63 | x | 0.7 | = | 56.93 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 110.23 | x | 0.63 | x | 0.7 | = | 180.91 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 114.87 | × | 0.63 | x | 0.7 | = | 45.99 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 114.87 | x | 0.63 | x | 0.7 | = | 59.33 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 114.87 | x | 0.63 | x | 0.7 | = | 188.52 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 110.55 | × | 0.63 | x | 0.7 | = | 44.26 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 110.55 | x | 0.63 | x | 0.7 | = | 57.1 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | X | 110.55 | x | 0.63 | x | 0.7 | = | 181.42 | (78) |
| South | 0.9x | 0.77 |) × | 1.31 | x | 108.01 | x | 0.63 | x | 0.7 | = | 43.24 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 108.01 | × | 0.63 | x | 0.7 | = | 55.79 | (78) |
| South | 0.9x | 0.7 <mark>7</mark> | x | 5.37 | x | 108.01 | x | 0.63 | x | 0.7 | = | 177.26 | (78) |
| South | 0.9x | 0.77 |) × | 1.31 | x | 104. <mark>8</mark> 9 | х | 0.63 | x | 0.7 | = | 41.99 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 104.89 | × | 0.63 | x | 0.7 | = | 54.18 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 104.89 | x | 0.63 | x | 0.7 | = | 172.15 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 101.89 | x | 0.63 | x | 0.7 | = | 40.79 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 101.89 | × | 0.63 | x | 0.7 | = | 52.62 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 101.89 | x | 0.63 | x | 0.7 | = | 167.21 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 82.59 | x | 0.63 | x | 0.7 | = | 33.06 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 82.59 | × | 0.63 | x | 0.7 | = | 42.65 | (78) |
| South | 0.9x | 0.77 | x | 5.37 | x | 82.59 | × | 0.63 | x | 0.7 | = | 135.53 | (78) |
| South | 0.9x | 0.77 | x | 1.31 | x | 55.42 | × | 0.63 | x | 0.7 | = | 22.19 | (78) |
| South | 0.9x | 0.77 | × | 1.69 | × | 55.42 | × | 0.63 | x | 0.7 | = | 28.62 | (78) |
| South | 0.9x | 0.77 | × | 5.37 | × | 55.42 | × | 0.63 | x | 0.7 | = | 90.95 | (78) |
| South | 0.9x | 0.77 | × | 1.31 | × | 40.4 | × | 0.63 | x | 0.7 | = | 16.17 | (78) |
| South | 0.9x | 0.77 | x | 1.69 | x | 40.4 | × | 0.63 | x | 0.7 | = | 20.87 | (78) |
| South | 0.9x | 0.77 | × | 5.37 | x | 40.4 | × | 0.63 | x | 0.7 | = | 66.3 | (78) |
| | | | | | | | | | | | | | |

| Solar g | ains in | watts, ca | alculated | for eac | h month | | - | (83)m = S | um(74)m . | (82)m | | | | |
|---|---|---------------------|------------|----------------------|-------------|-----------|----------------------|-----------|-----------|--------|--------|--------|------|--------|
| (83)m= | 119.59 | 195.86 | 249.49 | 281.98 | 293.84 | 282.78 | 276.29 | 268.32 | 260.62 | 211.25 | 141.76 | 103.34 | | (83) |
| Total g | ains – ii | nternal a | nd solar | ⁻ (84)m = | = (73)m - | ⊦ (83)m | , watts | | | | | | | |
| (84)m= | 4)m= 458.96 533.13 574.54 587.5 579.72 549.73 530.99 528.71 531.1 501.45 454.5 432.83 | | | | | | | | | | | | | (84) |
| 7. Mean internal temperature (heating season) | | | | | | | | | | | | | | |
| Temp | erature | during h | eating p | eriods ir | n the livir | ng area f | from Tab | ole 9, Th | 1 (°C) | | | | 21 | (85) |
| Utilisa | ation fac | tor for g | ains for l | iving are | ea, h1,m | (see Ta | ble 9a) | | | | | | | _ |
| Stroma I | SAP 201 | 2 v Ersio n: | 1.0.9.44 (| SAP 9.52 | - http://ww | vw.stroma | . _{com} lul | Aug | Sep | Oct | Nov | Dec | Page | 5 of 7 |

| (86)m= | 0.99 | 0.98 | 0.95 | 0.87 | 0.73 | 0.53 | 0.38 | 0.4 | 0.6 | 0.87 | 0.98 | 1 | | (86) |
|----------|-----------|-----------|-----------------|-----------|----------------|--------------------------|--------------|----------------|---------------|-----------------------|---------------------------------------|---------------------------------------|--------|-------|
| Mean | interna | l temper | ature in | living ar | ea T1 (fo | ollow ste | ps 3 to 7 | 7 in Tabl | e 9c) | | | | | |
| (87)m= | 20.45 | 20.6 | 20.76 | 20.91 | 20.98 | 21 | 21 | 21 | 21 | 20.92 | 20.67 | 20.43 | | (87) |
| Temp | erature | durina h | eating p | eriods ir | n rest of | dwelling | I from Ta | able 9. T | h2 (°C) | | | | | |
| (88)m= | 20.32 | 20.32 | 20.32 | 20.34 | 20.34 | 20.36 | 20.36 | 20.36 | 20.35 | 20.34 | 20.34 | 20.33 | | (88) |
| Litilior | tion for | tor for a | aine for l | roct of d | wolling | L | | () () | ļ | | | | 1 | |
| (89)m= | 0.99 | 0.98 | 0.94 | 0.84 | 0.69 | h2,m (se 0.48 | 0.32 | 9a) 0.34 | 0.54 | 0.84 | 0.97 | 0.99 | | (89) |
| | | | | | | | | | | | 0.07 | 0.00 | I | (00) |
| | | | | | r | ing T2 (f | 1 | r – | r | <u> </u> | 40.00 | 10.57 | 1 | (00) |
| (90)m= | 19.59 | 19.81 | 20.03 | 20.24 | 20.32 | 20.36 | 20.36 | 20.36 | 20.35 | 20.26 | 19.92 | 19.57 | | (90) |
| | | | | | | | | | | fLA = Livin | y alea ÷ (4 | +) = | 0.44 | (91) |
| Mean | interna | l temper | ature (fo | r the wh | ole dwe | lling) = f | LA x T1 | + (1 – fL | A) × T2 | - | | | | |
| (92)m= | 19.97 | 20.16 | 20.36 | 20.54 | 20.61 | 20.64 | 20.64 | 20.64 | 20.64 | 20.55 | 20.26 | 19.95 | | (92) |
| | adjustn | | he mear | interna | l temper | ature fro | m Table | e 4e, whe | ere appro | opriate | | | 1 | |
| (93)m= | 19.97 | 20.16 | 20.36 | 20.54 | 20.61 | 20.64 | 20.64 | 20.64 | 20.64 | 20.55 | 20.26 | 19.95 | | (93) |
| | | | uirement | | | | | | | | | | | |
| | | | | | | ned at st | ep 11 of | Table 9 | b, so tha | t Ti,m=(| 76)m an | d re-calc | ulate | |
| the ut | | | or gains | | | lum | | A | Con | Oat | Nevi | Dee | | |
| Litilion | Jan | Feb | Mar ains, hm | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | 1 | |
| (94)m= | 0.99 | 0.97 | 0.94 | 0.85 | 0.71 | 0.5 | 0.35 | 0.37 | 0.57 | 0.85 | 0.97 | 0.99 | | (94) |
| | | | , W = (94 | | | 0.5 | 0.00 | 0.57 | 0.57 | 0.00 | 0.37 | 0.99 |] | (01) |
| (95)m= | 454.71 | 519.39 | 538.95 | 501.03 | 409.11 | 276.71 | 185.57 | 193.83 | 301.4 | 427.16 | 442.59 | 429.97 | | (95) |
| | | | rnal tem | | | | | | | | | | I | () |
| (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) |
| | loss rate | | ı an intern | al tempe | erature. | L Lm,W = | I =[(39)m | I x [(93)m | | | | | 1 | |
| (97)m= | 767 | 743.33 | 671.63 | 550.48 | 419.65 | 277.38 | 185.61 | 193.88 | 303.13 | 468.57 | 625.43 | 756.1 | | (97) |
| Space | e heatin | g require | ement fo | r each n | ı nonth, k' | ı Wh/mon ⁻ | th = 0.02 | 1 24 x [(97 | ı)m – (95 |)m] x (4 ⁻ | 1)m | | 1 | |
| (98)m= | 232.35 | 150.49 | 98.71 | 35.61 | 7.84 | 0 | 0 | 0 | 0 | 30.81 | , 131.65 | 242.64 | | |
| | | | | | | | | Tota | l per year | (kWh/year | ·) = Sum(9 | 8)15,912 = | 930.09 | (98) |
| Space | - heatin | a require | ement in | k\//h/m² | 2/vear | | | | | | | | 13.82 | (99) |
| | | • • | | | • | | | | | | | | 13.02 | (00) |
| | | | nts – Indi | ividual h | eating s | ystems i | ncluding | i micro-C | (HP) | | | | | |
| • | e heatir | 0 | at from s | econdar | v/sunnle | ementary | svetem | | | | | | 0 | (201) |
| | | | | | | anemary | • | (202) = 1 | (201) - | | | | | |
| | | | at from m | - | | | | | | | | | 1 | (202) |
| Fracti | on of to | tal heati | ng from | main sys | stem 1 | | | (204) = (2 | 02) × [1 – | (203)] = | | | 1 | (204) |
| Efficie | ency of r | main spa | ace heat | ing syste | em 1 | | | | | | | | 93.7 | (206) |
| Efficie | ency of s | seconda | ry/supple | ementar | y heatin | g systen | า, % | | | | | | 0 | (208) |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | kWh/y | /ear |
| Space | e heatin | g require | ement (c | alculate | d above |) | | | · · · · · | • | · · · · · · · · · · · · · · · · · · · | · · · · · · · · · · · · · · · · · · · | | |
| | 232.35 | 150.49 | 98.71 | 35.61 | 7.84 | 0 | 0 | 0 | 0 | 30.81 | 131.65 | 242.64 | | |
| (211)m | n = {[(98 |)m x (20 | 4)] } x 1 | 00 ÷ (20 |)6) | | | | | | | | | (211) |
| | 247.97 | 160.61 | 105.35 | 38 | 8.36 | 0 | 0 | 0 | 0 | 32.88 | 140.5 | 258.96 | | |
| | | | | | • | | - | Tota | l (kWh/yea | ar) =Sum(2 | 211) _{15,1012} | Ē | 992.62 | (211) |
| | | | | | | | | | | | | | | |

Space heating fuel (secondary), kWh/month

| Space heating fuel (secondary), kWh/month | | | | | | | | |
|--|-------------------------------------|--------------|---------------|---|----------------------------|-------------|---|---|
| $= \{[(98)m \times (201)]\} \times 100 \div (208)$ | | | | | | | | |
| (215)m= 0 0 0 0 0 | 0 0 | 0 Total | 0 (kWh/yea | 0 | 0 | 0 | | (215) |
| Water besting | | TOtal | (KWIII)yea | ii) =0uiii(2 | 10) _{15,101} | 2 | 0 | (215) |
| Water heating Output from water heater (calculated above) | | | | | | | | |
| | 91.55 88.62 | 97.28 | 97.09 | 107.74 | 109.62 | 113.61 | | |
| Efficiency of water heater | | | | | | | 87.2 | (216) |
| | 87.2 87.2 | 87.2 | 87.2 | 87.95 | 89.08 | 89.55 | | (217) |
| Fuel for water heating, kWh/month (219)m = $(64)m \times 100 \div (217)m$ | | | | | | | | |
| | 04.99 101.63 | 111.56 | 111.34 | 122.5 | 123.06 | 126.86 | | |
| | • | Total | = Sum(21 | 19a) ₁₁₂ = | | | 1408.98 | (219) |
| Annual totals | | | | k\ | Nh/yeai | r | kWh/year | - |
| Space heating fuel used, main system 1 | | | | | | | 992.62 | |
| Water heating fuel used | | | | | | | 1408.98 | |
| Electricity for pumps, fans and electric keep-hot | | | | | | | | |
| mechanical ventilation - balanced, extract or pos | sitive input from | n outside | • | | | 108.07 | | (230a) |
| central heating pump: | | | | | | 30 | | (230 <mark>c</mark>) |
| boi <mark>ler wi</mark> th a fan-assisted flue | | | | | | 45 | | (230e) |
| Total electricity for the above, kWh/year | | sum | of (230a). | (<mark>2</mark> 30g) = | | | 183.07 | (231) |
| Electricity for lighting | | | | | | | 331 | (232) |
| Electricity generated by PVs | | | | | | | -259.09 | (233) |
| Total delivered energy for all uses (211)(221) + | (231) + (232) | (237b) | | | | | 2656.59 | (338) |
| 12a. CO2 emissions – Individual heating system | | | | | | | 2000100 | |
| Tza. 002 chilosiono - individual realing system | | | | | _ | | | |
| | Energy kWh/year | | | Emissi kg CO2 | ion fac 2/k\\/h | tor | Emissions kg CO2/yea | |
| Space heating (main system 1) | (211) x | | | | | | | r |
| opulo heating (main system 1) | | | | 0.04 | 16 | = | 214 41 | - |
| Space beating (secondary) | (215) x | | | 0.21 | | = | 214.41 | (261) |
| Space heating (secondary) | (215) x | | | 0.51 | 19 | = | 0 | (261) (263) |
| Water heating | (219) x | | | | 19 | | | (261) (263) (264) |
| Water heating Space and water heating | (219) x (261) + (262) | + (263) + (2 | 264) = | 0.51 | 19 | = | 0 | (261) (263) |
| Water heating | (219) x | + (263) + (2 | 264) = | 0.51 | 19 | = | 0 304.34 | (261) (263) (264) |
| Water heating Space and water heating | (219) x (261) + (262) | + (263) + (2 | 264) = | 0.51 | 19 16 19 | = | 0 304.34 518.75 | (261) (263) (264) (265) |
| Water heating Space and water heating Electricity for pumps, fans and electric keep-hot | (219) x (261) + (262) (231) x | + (263) + (2 | 264) = | 0.51 | 19 16 19 19 | = | 0 304.34 518.75 95.01 | (261) (263) (264) (265) (267) |
| Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies | (219) x (261) + (262) (231) x | + (263) + (: | | 0.51 0.21 0.51 | 19 16 19 19 19 | = = = | 0 304.34 518.75 95.01 171.79 |)(261))(263))(264))(265))(267))(268) |
| Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1 | (219) x (261) + (262) (231) x | + (263) + (2 | | 0.51 0.21 0.51 0.51 (265)(2 | 19 16 19 19 19 | = = = | 0 304.34 518.75 95.01 171.79 -134.47 |)(261))(263))(264))(265))(267))(268))(269) |
| Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year | (219) x (261) + (262) (231) x | + (263) + (2 | sum of | 0.51 0.21 0.51 0.51 (265)(2 | 19 16 19 19 19 | = = = | 0 304.34 518.75 95.01 171.79 -134.47 651.09 | (261) (263) (264) (265) (267) (268) (268) (269) (272) |

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 15 July 2021

Property Details: Unit 1 - 1B 2P - Be Green

| Dwelling type: | Flat |
|--|--------------------------------|
| Located in: | England |
| Region: | South East England |
| Cross ventilation possible: | Yes |
| Number of storeys: | 1 |
| Front of dwelling faces: | South |
| Overshading: | Average or unknown |
| Overhangs: | None |
| Thermal mass parameter: | Indicative Value Medium |
| Night ventilation: | False |
| Blinds, curtains, shutters: | None |
| Ventilation rate during hot weather (ach): | 3 (Windows open half the time) |
| Overheating Details: | |

| Summer ventilation heat loss coefficient: | 179.89 | (P1) |
|---|--------|------|
| Transmission heat loss coefficient: | 30.8 | |
| Summer heat loss coefficient: | 210.7 | (P2) |
| | | |

| Orientation: Ra | atio: | Z_overhangs: | | | | | |
|---------------------------|----------|---------------|-----------|----------|-----------|--------|---------|
| South (South Window) 0 | | 1 | | | | | |
| South (South Window 2)0 | | 1 | | | | | |
| South (South Window 3)0 | | 1 | | | | | |
| Solar shading: | | | | | | | |
| | | | | | | | |
| Orientation: Z | blinds: | Solar access: | Ove | erhangs: | Z summer: | | |
| South (South Window) 1 | | 0.9 | 1 | | 0.9 | | (P8) |
| South (South Window 2)1 | | 0.9 | 1 | | 0.9 | | (P8) |
| South (South Window 3)1 | | 0.9 | 1 | | 0.9 | | (P8) |
| Solar gains: | | | | | | | |
| Orientation | Area | Flux | g_ | FF | Shading | Gains | |
| South (South Window) 0. | 9 x 1.31 | 118.4 | 0.63 | 0.7 | 0.9 | 55.4 | |
| South (South Window 2)0. | 9 x 1.69 | 118.4 | 0.63 | 0.7 | 0.9 | 71.48 | |
| South (South Window 3)0. | 9 x 5.37 | 118.4 | 0.63 | 0.7 | 0.9 | 227.12 | |
| | | | | | Total | 354 | (P3/P4) |

Internal gains:

| | June | July | August |
|---|-----------------|--------|--------------------|
| Internal gains | 386.3 | 370.67 | 378.54 |
| Total summer gains | 753.66 | 724.67 | 722.96 (P5) |
| Summer gain/loss ratio | 3.58 | 3.44 | 3.43 (P6) |
| Mean summer external temperature (South East England) | 15.4 | 17.4 | 17.5 |
| Thermal mass temperature increment | 0.25 | 0.25 | 0.25 |
| Threshold temperature | 19.23 | 21.09 | 21.18 (P7) |
| Likelihood of high internal temperature | Not significant | Slight | Slight |
| | | | |

Assessment of likelihood of high internal temperature:

<u>Slight</u>

Regulations Compliance Report

| Approved Documer Printed on 15 July 2 | | , England assessed by S | Stroma FSAF | 2012 program, Vei | rsion: 1.0.5.41 | |
|--|---|--|-------------------------------------|----------------------------------|-----------------|------------|
| Project Information | | | | | | |
| Assessed By: | () | | | Building Type: | Flat | |
| Dwelling Details: | | | | | | |
| NEW DWELLING | DESIGN STAGE | | | Total Floor Area: 6 | 61m² | |
| Site Reference : | 106 Bexley Road | | | Plot Reference: | Unit 7 - 2B 3P | - Be Green |
| Address : | 106 Bexley Road , | Erith , DA8 3SP | | | | |
| Client Details: | | | | | | |
| Name: | Kang | | | | | |
| Address : | Upna Ltd , 106 Bez | kley Road , Erith , DA8 3 | SP | | | |
| - | s items included wi e report of regulati | thin the SAP calculatio ons compliance. | ons. | | | |
| 1a TER and DER | | | | | | |
| | ng system: Mains ga | IS | | | | |
| Fuel factor: 1.00 (m | iains gas) kide Emission Rate (| TFR) | | 18.54 kg/m² | | |
| - | ioxide Emission Rate | . , | | 10.94 kg/m² | | ОК |
| 1b TFEE and DFE | | | | | | |
| | gy Efficiency (TFEE) | | | 45.3 kWh/m ² | | |
| Dweiling Fabric Ene | ergy Efficiency (DFE | . C) | | 36.6 kWh/m ² | | OK |
| 2 Fabric U-values | S S | | | | | |
| Element External w Party wall Floor Roof | /all | Average 0.16 (max. 0.30) 0.00 (max. 0.20) (no floor) (no roof) | | Highest 0.16 (max. 0.70) - | | ок ок |
| Openings | | 1.17 (max. 2.00) | | 1.20 (max. 3.30) | | ОК |
| 2a Thermal bridg | ing | | | | | |
| | | om linear thermal transm | nittances for e | each junction | | |
| 3 Air permeability | | | | 4.00 (designs und | | |
| Maximum | ility at 50 pascals | | | 4.00 (design val 10.0 | ue) | ОК |
| 4 Heating efficier | су | | | | | |
| Main Heating | g system: | Database: (rev 479, pro Boiler systems with rad Brand name: Worcester Model: Greenstar Model qualifier: 32CDi (Combi) Efficiency 89.8 % SEDI Minimum 88.0 % | diators or und er Compact Erl | derfloor heating - ma | ains gas | ОК |
| Secondary h | neating system: | None | | | | |

Regulations Compliance Report

| Cylinder insulation | | | |
|---|------------------------|---------------------|-----|
| Hot water Storage: | No cylinder | | |
| Controls | | | |
| | | | |
| Space heating controls | TTZC by plumbing and e | electrical services | OK |
| Hot water controls: | No cylinder thermostat | | |
| | No cylinder | | 014 |
| Boiler interlock: | Yes | | OK |
| 7 Low energy lights Percentage of fixed lights wit | h low operav fittinge | 100.0% | |
| Minimum | n low-energy mungs | 75.0% | ок |
| 3 Mechanical ventilation | | 10.070 | OR |
| Continuous supply and extra | ct system | | |
| Specific fan power: | | 0.39 | |
| Maximum | | 1.5 | ОК |
| MVHR efficiency: | | 93% | |
| Minimum | | 70% | OK |
| 9 Summertime temperature | | | |
| Overheating risk (South East | England): | Slight | OK |
| ased on: | | | |
| Overshading: | | Average or unknown | |
| Windows facing: South Windows facing: North | | 3.42m ² | |
| Windows facing: North | | 4.09m ² | |
| Ventilation rate: | | 3.00 | |
| Blinds/curtains: | | None | |
| | | | |
| 0 Key features | | | |
| Doors U-value | | 1 W/m²K | |
| Party Walls U-value | | 0 W/m²K | |
| Photovoltaic array | | | |

Property Details: Unit 7 - 2B 3P - Be Green

| Address: Located in: | 106 Bexley Road , Erith , DA8 3SP England |
|-----------------------------------|--|
| Region: | South East England |
| UPRN: | |
| Date of assessment: | 13 July 2021 |
| Date of certificate: | 15 July 2021 |
| Assessment type: | New dwelling design stage |
| Transaction type: | New dwelling |
| Tenure type: | Unknown |
| Related party disclosure: | No related party |
| Thermal Mass Parameter: | Indicative Value Medium |
| Water use <= 125 litres/person/da | ay: True |
| PCDF Version: | 479 |

| Property description | | | | | | | | |
|--------------------------------|--------------|---------------------|----------------------------|----------------|-------------------------------|--------------|--------------|-------------|
| Dwelling type: | | Flat | | | | | | |
| Detachment: Year Completed: | | 2021 | | | | | | |
| Floor Location: | | Floor | area. | | | | | |
| | | | | | Storey height | : | | |
| Floor 0 | | 61 m² | | | 2.7 m | | | |
| Living area: | | 26.4 m ² | (fraction 0.433) | | | | | |
| Front of dwelling fa | aces: | East | , | | | | | |
| Opening types: | | | | | | | | |
| Name: | Source: | Т | 100: | Glazing: | | Argon | Fram | o . |
| Front Door | Manufacturer | | /pe: lid | Glazing. | | Argon: | Wood | е. |
| South Window | SAP 2012 | | indows | low-E, En = | 0.05, soft coat | Yes | PVC-U | |
| North Window | SAP 2012 | Wi | indows | low-E, En = | 0.0 <mark>5, soft</mark> coat | Yes | PVC-U | |
| North Window 2 | SAP 2012 | Wi | indows | low-E, En = | 0.05, soft coat | Yes | PVC-U | |
| Name: | Gap: | | Frame Facto | or a-value | U-value: | Area: | No o | f Openings: |
| Front Door | mm | | 0.7 | 0 | 1 | 1.91 | 1 | e penniger |
| South Window | 16mm or | more | 0.7 | 0.63 | 1.2 | 1.71 | 1 | |
| North Window | 16mm or | | 0.7 | 0.63 | 1.2 | 1.71 | 2 | |
| North Window 2 | 16mm or | more | 0.7 | 0.63 | 1.2 | 4.09 | 1 | |
| Name: | Type-Name | e: Lo | ocation: | Orient: | | Width: | Heigh | nt: |
| Front Door | | | ternal Wall | East | | 0.91 | 2.1 | |
| South Window | | | ternal Wall | South | | 0.9 | 1.9 | |
| North Window North Window 2 | | | ternal Wall ternal Wall | North North | | 0.9 1.475 | 1.9 2.775 | |
| NOLUT WILLOW 2 | | EX | | NOLUT | | 1.473 | 2.775 | |
| Overshading: | | Average | e or unknown | | | | | |
| Opaque Elements: | | 5 | | | | | | |
| - | <u>_</u> | | N 1 | | | a | | |
| Type: (External Elements | Gross area: | Openings: | Net area: | U-value: | Ru value: | Curtain | wall: | Kappa: |
| External Wall | 66.42 | 11.13 | 55.29 | 0.16 | 0 | False | | N/A |
| Corridor Wall | 7.83 | 0 | 7.83 | 0.16 | 0.4 | False | | N/A |
| Internal Elements | | | | | | | | |
| Party Elements | | | | | | | | |
| Party Wall | 32.13 | | | | | | | N/A |
| Party Ceiling Party Floor | 61 61 | | | | | | | N/A N/A |
| i arty i 1001 | 01 | | | | | | | |

| Thermal bridges: | User-define | d (individual F | PSI-values) | Y-Value = 0.0708 |
|---------------------------------------|---|--|---|---|
| | Length | Psi-valu | | |
| [Approved] | 5.23 | 0.3 | E2 | Other lintels (including other steel lintels) |
| [Approved] | 2.7 | 0.04 | E3 | Sill |
| [Approved] | 21.1 | 0.05 | E4 | Jamb |
| [Approved] | 24.6 | 0.07 | E7 | Party floor between dwellings (in blocks of flats) |
| [Approved] | 4.3 | 0.02 | E9 | Balcony between dwellings, wall insulation continuous |
| [Approved] | 11.9 | 0.06 | E18 | Party wall between dwellings |
| [[[[[[[[[[[[[[[[[[[| | | | |
| Ventilation: | | | | |
| Pressure test: | Yes (As des | • | | |
| Ventilation: | | ith heat recov | • | |
| | | wet rooms: Ki | | |
| | Ductwork: | Insulation, rigi | id | |
| | Approved I | nstallation Sch | neme: True | |
| Number of chimneys: | 0 | | | |
| Number of open flues: | 0 | | | |
| Number of fans: | 0 | | | |
| Number of passive stacks: | 0 | | | |
| Number of sides sheltered: | 1 | | | |
| Pressure test: | 4 | | | |
| Main heating system: | | | | |
| | Database: Brand name Model: Gree Model quali (Combi boil Underfloor Central hea | e: Worcester enstar fier: <u>32CD</u> i Co er) heating and ra ting pump : 2 v temperature: ock: Yes | ompact ErP adiators, pi 013 or late | pes in insulated timber floor |
| Main heating Control: | | 1 | | |
| Vain heating Control: | Time and te | emperature zo | one control | by suitable arrangement of plumbing and electrical |
| nam nearing controll | services | | | 5 1 5 |
| | Control cod | e: 2110 | | |
| Secondary heating system: | | т. | | |
| Secondary heating system: | None | | | |
| Water heating: | | | | |
| Water heating: | From main | heating syster | m | |
| rator nouting. | Water code | | | |
| | Fuel :mains | | | |
| | No hot wat | • | | |
| | | | System | |
| | | eat Recovery S | | 040025) |
| | Database | (rev 479, proc | | 000030) |
| | | \\\' | | |
| | | ne: Worcester | | |
| | Model: Gr | ne: Worcester eenstar Xtra Ilifier: 2015 | | |

Waste Water Heat Recovery System: Total rooms with shower and/or bath: 1 Product index: 080106, Megaflo SHRU 60 System B Number of mixer showers in rooms with a bath: 1 Number of mixer showers in rooms without a bath: 0 Solar panel: False

Others:

Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics: Standard Tariff Unknown No conservatory 100% Low rise urban / suburban English No <u>Photovoltaic 1</u> Installed Peak power: 0.3 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:



| User Details: | | | | | | | | | | |
|---|--|-------------------------------------|---------------------|------------------------------|----------------|------------------|-----------------------|--------------------------|----------------------------|---------------------|
| Assessor Name: Software Name: | Stroma FSA | | | Stroma Softwa Address: | re Ver | sion: | - Be Gre | | on: 1.0.5.41 | |
| Address : | 106 Bexley Ro | | | -uuress. | | 2001 - | De Ole | GII | | |
| 1. Overall dwelling dime | ç | 500 , Entri, B7 | | | | | | | | |
| Ground floor | | | | a(m²) 61 | (1a) x | r | ight(m) 2.7 | (2a) = | Volume(m³) 164.7 | (3a) |
| Total floor area TFA = (1 | a)+(1b)+(1c)+(1c | d)+(1e)+(1r | ı) | 61 | (4) | | | | | |
| Dwelling volume | | | | | (3a)+(3b) | +(3c)+(3d | l)+(3e)+ | .(3n) = | 164.7 | (5) |
| 2. Ventilation rate: | | | | | | | | | | |
| Number of chimneys Number of open flues | main heating 0 | secondar heating + 0 + 0 | y] + [] + [| 0 0 |] = [] = [| total 0 0 | | 40 = 20 = | m ³ per hour | (6a) (6b) |
| Number of intermittent fa | ans | | | | , r | 0 | x | 10 = | 0 | _](7a) |
| Number of passive vents | 3 | | | | | 0 | x ^ | 10 = | 0 |](7b) |
| Number of flueless gas f | | | | | | - | | 40 = | - | (76) (7c) |
| Infiltration due to chimne | | s = (6a)+(6b)+(7 | 'a)+(7b)+(1 | 7c) = | | 0 | | Air ch ÷ (5) = | o nanges per hou 0 | |
| If a pressurisation test has a Number of storeys in t Additional infiltration Structural infiltration: C if both types of wall are p deducting areas of open | he dw <mark>elling</mark> (ns)).25 for steel or ti present, use the value | mber frame or e corresponding to | 0.35 for | masonr | y constr | | | -1]x0.1 = | 0 0 0 | (9) (10) (11) |
| If suspended wooden | • | | .1 (seale | d), else | enter 0 | | | | 0 | (12) |
| lf no draught lobby, er | nter 0.05, else en | ter 0 | | | | | | | 0 | (13) |
| Percentage of window | rs and doors drau | ight stripped | | | | | | | 0 | (14) |
| Window infiltration | | | | 0.25 - [0.2 | x (14) ÷ 1 | = [00 | | | 0 | (15) |
| Infiltration rate | | | | (8) + (10) - | | · · · · | | | 0 | (16) |
| Air permeability value, | • • | | • | • | • | etre of e | envelope | area | 4 | (17) |
| If based on air permeabi | • | | | | | | 1 | | 0.2 | (18) |
| Air permeability value applie Number of sides shelter | | test has been don | ie or a deg | ree air per | meability i | s being us | sea | | 1 | (19) |
| Shelter factor | 30 | | | (20) = 1 - [| 0.075 x (1 | 9)] = | | | 1 0.92 | (10) |
| Infiltration rate incorpora | ting shelter facto | r | | (21) = (18) | x (20) = | | | | 0.19 | (21) |
| Infiltration rate modified | for monthly wind | speed | | | | | | | | -1 |
| Jan Feb | Mar Apr | May Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly average wind sp | beed from Table | 7 | | | | | | | | |
| (22)m= 5.1 5 | 4.9 4.4 | 4.3 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 | | |
| Wind Factor (22a)m = (2 | 22)m ÷ 4 | | | | | | - | | | |
| (22a)m= 1.27 1.25 | <u> </u> | 1.08 0.95 | 0.95 | 0.92 | 1 | 1.08 | 1.12 | 1.18 | | |
| | | | | | | | | | | |

| Adjust | ed infiltr | ation rat | e (allow | ing for sl | nelter an | d wind s | peed) = | (21a) x | (22a)m | | | - | - | |
|---------------------|------------|-------------------------|------------|-------------------|----------------------------|----------------|-------------|--------------|--------------|---|------------------|--------------------|---------------|-------|
| | 0.24 | 0.23 | 0.23 | 0.2 | 0.2 | 0.18 | 0.18 | 0.17 | 0.19 | 0.2 | 0.21 | 0.22 | | |
| | | ctive air al ventila | - | rate for t | the appli | cable ca | se | | | | | | 0.5 | |
| | | | | endix N (2 | 23b) = (23a |) × Fmv (e | auation (N | (5)) othe | rwise (23h |) - (23a) | | | 0.5 | (23a) |
| | | • • | 0 | | allowing f | , (| • | ,, . | |) = (200) | | | 0.5 | (23b) |
| | | | - | - | - | | | | | 0 h)ma (| 00h) [/ | 1 (00 a) | 79.05 | (23c) |
| | | 0.34 | 0.33 | 0.31 | 0.3 | 0.28 | | 1R) (24a | 0.29 | <u>, </u> | 1 - | 0.32 |) ÷ 100]] | (24a) |
| (24a)m= | | | | | | | | | | 0.3 | 0.31 | 0.32 | | (244) |
| , | | 1 | · · · · · | 1 | without | | · · · · · | r Ó | , , | rí (| , | | 1 | (246) |
| (24b)m= | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | J | (24b) |
| , | | | | | or positiv c) = (23b | • | | | | .5 × (23b |)) | | | |
| (24c)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24c) |
| | | | | | se positiv b)m othe | | | | | 0.5] | | | - | |
| (24d)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24d) |
| Effe | ctive air | change | rate - ei | nter (24a | 1) or (24b | o) or (24 | c) or (24 | d) in bo | (25) | • | • | • | • | |
| (25)m= | 0.34 | 0.34 | 0.33 | 0.31 | 0.3 | 0.28 | 0.28 | 0.28 | 0.29 | 0.3 | 0.31 | 0.32 | | (25) |
| 2 4 | ot loopo | o ond he | | ooromot | | | | | | | | | , | |
| | | S and he Gros | | paramet Openir | | Net Ar | 00 | U-val | | AXU | | k-value | _ | AXk |
| ELEN | IENT | area | | | 198 1 ² | A,r | | W/m2 | | (W/I | K) | k-value kJ/m²·l | | kJ/K |
| Doo <mark>rs</mark> | | | | | | 1.91 | x | 1 | = | 1.91 | | | | (26) |
| Windo | ws Type | e 1 | | | | 1.71 | x1, | /[1/(1.2)+ | 0.04] = | 1.96 | F | | | (27) |
| Windo | ws Type | 2 | | | | 1.71 | X 1/ | /[1/(1.2)+ | 0.04] = | 1.96 | F | | | (27) |
| | ws Type | | | | | 4.09 | | /[1/(1.2)+ | | 4.68 | 5 | | | (27) |
| Walls | | 66.4 | 12 | 11.1 | 3 | 55.29 | | 0.16 | | 8.85 | | | | (29) |
| Walls | | | | | | | | | = | | ╡┟ | | - | (29) |
| | | 7.8: elements | | 0 | | 7.83 | | 0.15 | = [| 1.18 | | | | |
| Party | | lements | , 111- | | | 74.25 32.13 | | 0 | = | 0 | | | | (31) |
| Party f | loor | | | | | 61 | | | ' | | L | | \exists | (32a) |
| Party | ceiling | | | | | 61 | | | | | L L | | \dashv | (32b) |
| * for win | ndows and | | | | indow U-va Ils and part | alue calcul | ated using | formula 1 | /[(1/U-valı | ıe)+0.04] a | L as given in | paragraph | n 3.2 | |
| Fabric | heat los | s, W/K | = S (A x | U) | | | | (26)(30) | + (32) = | | | | 22.49 | (33) |
| | | Cm = S(| • | , | | | | | ((28) | (30) + (32 | 2) + (32a). | (32e) = | 12222.7 | |
| | | | . , | ⊃ = Cm - | ÷ TFA) ir | ∩ kJ/m²K | | | Indica | tive Value | : Medium | | 250 | (35) |
| For des | ign assess | | ere the de | etails of the | , constructi | | | ecisely the | e indicative | e values of | TMP in Ta | able 1f | | (==) |
| | | | | | using Ap | pendix I | < | | | | | | 5.25 | (36) |
| if details | - | al bridging | | | = 0.05 x (3 | • | | | (33) + | (36) = | | | L | |
| | | | alculator | d monthl | v | | | | | | 25)m x (5) | | 27.75 | (37) |
| ventile | | 1 | i | 1 | | lun | 1 | A | . , | <u> </u> | | <u> </u> | 1 | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | J | |

| (38)m= | 18.51 | 18.26 | 18.01 | 16.75 | 16.5 | 15.25 | 15.25 | 14.99 | 15.75 | 16.5 | 17.01 | 17.51 | | (38) |
|-------------------|-------------------|---------------------------------|---------------------|------------------|----------------|-------------|------------|-------------|-----------------------|------------------------|------------------------|-----------|---------|-------|
| Heat tra | ansfer o | coefficie | nt, W/K | | | | | | (39)m | = (37) + (3 | 38)m | | | |
| (39)m= | 46.26 | 46.01 | 45.76 | 44.5 | 44.25 | 42.99 | 42.99 | 42.74 | 43.49 | 44.25 | 44.75 | 45.25 | | |
| | | motor (l | HLP), W | /m2k | | | | | | Average = = (39)m ÷ | | 12 /12= | 44.44 | (39) |
| (40)m= | 0.76 | 0.75 | 0.75 | 0.73 | 0.73 | 0.7 | 0.7 | 0.7 | 0.71 | = (39)III ÷ | 0.73 | 0.74 | | |
| (10) | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.17 | 0.1 | 0.1 | | Average = | | | 0.73 | (40) |
| Numbe | er of day | /s in mo | nth (Tab | le 1a) | - | | - | | | | | | | |
| | 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. Wa | ter hea | ting ene | rgy requ | irement: | | | | | | | | kWh/ye | ar: | |
| if TF. | A > 13. | upancy, 9, N = 1 9, N = 1 | | ([1 - exp | (-0.0003 | 849 x (TF | -13.9 |)2)] + 0.(|)013 x (⁻ | TFA -13. | | 01 | | (42) |
| | | , | ater usad | ge in litre | es per da | ay Vd.av | erage = | (25 x N) | + 36 | | 81 | .93 | | (43) |
| Reduce | the annua | al average | hot water | usage by | 5% if the a | lwelling is | designed t | | | se target o | | | | (-) |
| not more | | | | r day (all w | | | · | | | | | | | |
| Hot wate | Jan er usage i | Feb | Mar | Apr ach month | May | Jun | Jul | Aug (43) | Sep | Oct | Nov | Dec | | |
| | 90.13 | 86.85 | 83.57 | 80.29 | 77.02 | 73.74 | 73.74 | 77.02 | 80.29 | 83.57 | 86.85 | 90.13 | | |
| (44)m= | 90.13 | 00.05 | 03.57 | 00.29 | 11.02 | 13.14 | 73.74 | 11.02 | | Total = Su | | | 983.18 | (44) |
| Energy o | content of | hot water | used - ca | lculated mo | onthly $= 4$. | 190 x Vd,r | n x nm x D |)Tm / 3600 | | | · · · | | | |
| (45)m= | 133.65 | 116.89 | 120.62 | 105.16 | 100.91 | 87.07 | 80.69 | 92.59 | 93.7 | 10 <mark>9.19</mark> | 119.19 | 129.44 | | |
| If instant | | ratar baati | ing of point | h of yoo /m | hatwata | (atorogo) | antor 0 in | haven /16 | | Total = Su | m(45) ₁₁₂ = | = | 1289.11 | (45) |
| | | i | , 1 | t of use (no | | ,, o | | , , I | , | | | | | (40) |
| (46)m= Water s | 20.05 storage | 17.53 IOSS: | 18.09 | 15.77 | 15.14 | 13.06 | 12.1 | 13.89 | 14.05 | 16.38 | 17.88 | 19.42 | | (46) |
| | - | |) includir | ng any so | olar or W | /WHRS | storage | within sa | ame ves | sel | | 0 | | (47) |
| If comr | nunity h | neating a | and no ta | ank in dw | velling, e | nter 110 | litres in | (47) | | | L | | | |
| | | | hot wate | er (this ir | ncludes i | nstantar | neous co | mbi boil | ers) ente | er '0' in (| 47) | | | |
| | storage | | oclared I | oss facto | or ie kno | wp (k\//k | v/dav). | | | | | | | (48) |
| , | | | om Table | | | | vuay). | | | | | 0 | | (48) |
| | | | | , kWh/ye | ear | | | (48) x (49) |) = | | | 0 | | (50) |
| 0, | | | • | cylinder l | | or is not | | (-/ (-) | | | | • | | (00) |
| | | - | | rom Tabl | e 2 (kW | h/litre/da | ıy) | | | | | 0 | | (51) |
| | • | from Ta | see secti ble 2a | on 4.3 | | | | | | | | 0 | | (52) |
| | | | om Table | 2b | | | | | | | | 0 0 | | (52) |
| | | | | e, kWh/ye | ear | | | (47) x (51) | x (52) x (| 53) = | | 0 | | (54) |
| Enter | (50) or | (54) in (5 | 55) | · | | | | | | | | 0 | | (55) |
| Water | storage | loss cal | culated | for each | month | | | ((56)m = (| 55) × (41) | m | | | | |
| (56)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (56) |
| If cylinde | r contain | s dedicate | d solar sto | orage, (57) | m = (56)m | x [(50) – (| H11)] ÷ (5 | 0), else (5 | 7)m = (56) | m where (| H11) is fro | m Appendi | хH | |
| (57)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (57) |

| Primary circuit loss (annual) fro Primary circuit loss calculated | | (59)m = (58) ÷ 3(| 65 × (41)m | | | 0 | | (58) |
|--|---------------------|---------------------|-----------------------|--------------------------|--------------|-------------|---------------|------------|
| (modified by factor from Tab | le H5 if there is s | solar water heati | ng and a cylin | der thermo | ostat) | | | |
| (59)m= 0 0 0 | 0 0 | 0 0 | 0 0 | 0 | 0 | 0 | | (59) |
| Combi loss calculated for each | 1 month (61)m = | (60) ÷ 365 × (41 |)m | | | | | |
| (61)m= 24.91 22.5 24.91 | 24.11 24.91 | 24.11 24.91 | 24.91 24.1 | 1 24.91 | 24.11 | 24.91 | | (61) |
| Total heat required for water h | eating calculated | I for each month | (62)m = 0.85 | × (45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= 158.57 139.4 145.54 | 129.27 125.82 | 111.18 105.6 | 117.5 117.8 | 134.11 | 143.3 | 154.35 | | (62) |
| Solar DHW input calculated using App | endix G or Appendix | H (negative quantit | y) (enter '0' if no s | olar contribut | tion to wate | er heating) | I | |
| (add additional lines if FGHRS | and/or WWHRS | applies, see Ap | pendix G) | | | | | |
| (63)m= 0 0 0 | 0 0 | 0 0 | 0 0 | 0 | 0 | 0 | | (63) |
| FHRS 13.56 11.36 11 | 8.94 8.31 | 7.19 6.8 | 7.71 7.77 | 9.34 | 11.2 | 13.3 | | (63) (G2) |
| WWHRS -29.24 -25.72 -26.26 | -21.63 -20.1 | -16.59 -14.06 | -17.01 -17.9 | 5 -21.62 | -25.01 | -28.26 | | (63) (G10) |
| Output from water heater | · | | · · · · | | | | | |
| (64)m= 114.48 101.15 106.99 | 97.46 96.13 | 86.17 83.47 | 91.5 91.2 | 9 101.87 | 105.84 | 111.5 | | - |
| | | | Output from | water heate | r (annual) | 12 | 1187.85 | (64) |
| Heat gains from water heating | | - , , | | | | <u> </u> |] | |
| (65)m= 50.67 44.49 46.34 | 40.99 39.78 | 34.98 33.06 | 37.01 37.1 | 8 42.54 | 45.66 | 49.27 | | (65) |
| in <mark>clude</mark> (57)m in calculation | of (65)m only if c | ylinder is in the | dwelling or ho | wate <mark>r is f</mark> | rom com | munity h | leating | |
| 5. Internal gains (see Table § | 5 and 5a): | | | | | | | |
| Met <mark>abolic</mark> gains (Ta <mark>ble 5),</mark> Wat | tts | | | | | | | |
| Jan Feb Mar | Apr May | Jun Jul | Aug Se | p Oct | Nov | Dec | | |
| (66)m= 120.59 120.59 120.59 | 120.59 120.59 | 120.59 120.59 | 120.59 120.5 | 9 120.59 | 120.59 | 120.59 | | (66) |
| Lighting gains (calculated in Ap | ppendix L, equat | ion L9 or L9a), a | Ilso see Table | 5 | | | | |
| (67)m= 41.27 36.66 29.81 | 22.57 16.87 | 14.24 15.39 | 20.01 26.8 | 5 34.09 | 39.79 | 42.42 | | (67) |
| Appliances gains (calculated in | | | , | | | | | |
| (68)m= 261.88 264.6 257.75 | 243.17 224.77 | 207.47 195.92 | 193.2 200.0 | 5 214.63 | 233.03 | 250.33 | | (68) |
| Cooking gains (calculated in A | ppendix L, equat | tion L15 or L15a |), also see Tal | ole 5 | | | _ | |
| (69)m= 49.07 49.07 49.07 | 49.07 49.07 | 49.07 49.07 | 49.07 49.0 | 7 49.07 | 49.07 | 49.07 | | (69) |
| Pumps and fans gains (Table s | 5a) | | | | | | _ | |
| (70)m= 3 3 3 | 3 3 | 3 3 | 3 3 | 3 | 3 | 3 | | (70) |
| Losses e.g. evaporation (nega | tive values) (Tab | ole 5) | | | | | | |
| (71)m= -80.39 -80.39 -80.39 | -80.39 -80.39 | -80.39 -80.39 | -80.39 -80.3 | 9 -80.39 | -80.39 | -80.39 | | (71) |
| Water heating gains (Table 5) | | | | | | | | |
| (72)m= 68.1 66.21 62.28 | 56.94 53.47 | 48.58 44.43 | 49.75 51.6 | 4 57.17 | 63.42 | 66.22 | | (72) |
| Total internal gains = | | (66)m + (67)n | n + (68)m + (69)m | + (70)m + (7 | '1)m + (72) |)m | | |
| (73)m= 463.52 459.73 442.11 | 1 1 | | | 4 000 40 | 428.5 | 454.00 | 1 | (72) |
| | 414.94 387.37 | 362.56 348.01 | 355.22 370.8 | 398.16 | 420.3 | 451.23 | | (73) |
| 6. Solar gains: | 414.94 387.37 | 362.56 348.01 | 355.22 370.8 | 398.16 | 420.5 | 451.23 | | (73) |
| 6. Solar gains: Solar gains are calculated using sola Orientation: Access Factor | | | 1 1 | | | | Gains | (73) |

| North | 0.9x | 0.77 | × | 1.71 | × | 10.63 | × | 0.63 | x | 0.7 | = | 11.11 | (74) |
|-------|------|------|-----|------|---|--------|---|------|---|-----|---|-------|------|
| North | 0.9x | 0.77 | l x | 4.09 | x | 10.63 | x | 0.63 | x | 0.7 | = | 13.29 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | x | 20.32 | x | 0.63 | x | 0.7 | = | 21.24 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 20.32 | × | 0.63 | x | 0.7 | = | 25.4 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | × | 34.53 | × | 0.63 | x | 0.7 | = | 36.09 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 34.53 | × | 0.63 | x | 0.7 | = | 43.16 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | x | 55.46 | x | 0.63 | x | 0.7 | = | 57.97 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 55.46 | × | 0.63 | x | 0.7 | = | 69.33 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | x | 74.72 | × | 0.63 | x | 0.7 | = | 78.09 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 74.72 | x | 0.63 | x | 0.7 | = | 93.39 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | × | 79.99 | × | 0.63 | x | 0.7 | = | 83.6 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 79.99 | × | 0.63 | x | 0.7 | = | 99.98 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | × | 74.68 | × | 0.63 | x | 0.7 | = | 78.05 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 74.68 | × | 0.63 | x | 0.7 | = | 93.34 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | × | 59.25 | × | 0.63 | x | 0.7 | = | 61.92 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 59.25 | × | 0.63 | x | 0.7 | = | 74.06 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | x | 41.52 | x | 0.63 | x | 0.7 | = | 43.39 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | X | 41.52 | х | 0.63 | х | 0.7 | = | 51.89 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | x | 24.19 | x | 0.63 | x | 0.7 | = | 25.28 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | х | 24.19 | × | 0.63 | x | 0.7 | = | 30.24 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | x | 13.12 | x | 0.63 | x | 0.7 | = | 13.71 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | × | 13.12 | х | 0.63 | x | 0.7 | = | 16.4 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | x | 8.86 | × | 0.63 | x | 0.7 | = | 9.27 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 8.86 | x | 0.63 | x | 0.7 | = | 11.08 | (74) |
| South | 0.9x | 0.77 | x | 1.71 | × | 46.75 | x | 0.63 | x | 0.7 | = | 24.43 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | × | 76.57 | × | 0.63 | x | 0.7 | = | 40.01 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | × | 97.53 | x | 0.63 | x | 0.7 | = | 50.97 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | x | 110.23 | x | 0.63 | x | 0.7 | = | 57.61 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | × | 114.87 | × | 0.63 | x | 0.7 | = | 60.03 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 110.55 | × | 0.63 | x | 0.7 | = | 57.77 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | x | 108.01 | × | 0.63 | x | 0.7 | = | 56.45 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | × | 104.89 | × | 0.63 | x | 0.7 | = | 54.82 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 101.89 | × | 0.63 | x | 0.7 | = | 53.25 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 82.59 | × | 0.63 | x | 0.7 | = | 43.16 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 55.42 | × | 0.63 | x | 0.7 | = | 28.96 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | x | 40.4 | × | 0.63 | x | 0.7 | = | 21.11 | (78) |

| Solar gains in watts, calculated for each month(83)m = Sum(74)m(82)m | | | | | | | | | | | | | | |
|--|-----------|------------|-----------|-----------|------------------------|-----------|----------------------|-----------|--------|--------|--------|--------|------|--------|
| (83)m= | 48.84 | 86.65 | 130.22 | 184.91 | 231.52 | 241.35 | 227.84 | 190.8 | 148.53 | 98.68 | 59.07 | 41.46 | | (83) |
| Total g | ains – ii | nternal a | and solar | (84)m = | = (73)m - | ⊦ (83)m | , watts | | | | | | | |
| (84)m= | 512.36 | 546.39 | 572.33 | 599.85 | 618.89 | 603.92 | 575.85 | 546.02 | 519.34 | 496.83 | 487.57 | 492.69 | | (84) |
| 7. Me | an inter | nal temp | perature | (heating | season |) | | | | | | | | |
| Temp | erature | during h | eating p | eriods ir | n the livir | ng area f | from Tab | ole 9, Th | 1 (°C) | | | | 21 | (85) |
| Utilisation factor for gains for living area, h1,m (see Table 9a) | | | | | | | | | | | | | | |
| Stroma I | SAP 201 | 2 vErsion: | 1.0.9.44 | SAP 9.52 | - _h ttp:/// | vw.stroma | . _{com} Jul | Aug | Sep | Oct | Nov | Dec | Page | 5 of 8 |

| (0)m 0.80 0.87 0.84 0.89 0.89 (0) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c); (07) 7 7 20.52 20.51 20.52 20.52 20.52 20.52 20.52 20.52 20.52 20.52 20.52 20.53 20.51 20.52 20.53 20.52 20.51 20.55 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.51 20.52 20.57 (02) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c); | | | | | | • | | ī | ī | | | | | | |
|---|---------|------------|-------------------------|------------|---------------|-----------|------------|-----------|------------|---|-------------------|---------------------------------|--------------------|--------|-------|
| (87)m- 20.55 20.65 20.78 20.83 20.83 20.74 20.54 (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C) (68)m- 20.29 20.29 20.32 20.31 20.32 20.34 20.34 20.34 20.34 20.33 20.32 20.33 (68) Willisation factor for gains for rest of dwelling, T2,m (see Table 9a) (69)m- 10.85 0.81 0.41 0.28 0.31 0.52 0.81 0.96 0.86 (69) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (00)m- 10.71 (00) (01) 0.43 (01) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) 20.07 20.19 20.36 20.62 20.62 20.63 20.62 20.53 20.32 20.07 (93) Sigm- 20.07 20.19 20.36 20.64 20.62 20.63 20.62 20.63 20.62 20.65 20.32 20.07 (93) Sigm- 20.19 20.36 20.42 20.62 20.63 20.65 40.64 </td <td>(86)m=</td> <td>0.98</td> <td>0.97</td> <td>0.93</td> <td>0.83</td> <td>0.65</td> <td>0.45</td> <td>0.33</td> <td>0.36</td> <td>0.57</td> <td>0.84</td> <td>0.96</td> <td>0.98</td> <td></td> <td>(86)</td> | (86)m= | 0.98 | 0.97 | 0.93 | 0.83 | 0.65 | 0.45 | 0.33 | 0.36 | 0.57 | 0.84 | 0.96 | 0.98 | | (86) |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | Mean | internal | temper | ature in | living ar | ea T1 (fe | ollow ste | ps 3 to 7 | 7 in Tabl | e 9c) | | | | | |
| (88)m 20.29 20.3 20.31 20.32 20.34 20.34 20.33 20.32 20.31 20.3 (88) Utilisation factor for gains for rest of dwelling, h2, m (see Table 9a) (99)m 0.86 0.95 0.92 0.8 0.51 0.41 0.28 0.31 0.52 0.81 0.95 0.88 (99) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m 19.71 19.85 0.04 20.44 20.34 20.34 20.33 20.25 0.98 (99) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) Apply adjustment to the mean internal temperature form Table 4e, where appropriate (93) (93) Septe heating requirement 20.64 20.62 20.63 20.62 20.54 20.32 20.07 (93) Septe heating factor for gains bing Table 9a (94)m (95) (96)m (96)m (96)m (96)m (96)m (96)m (96)m (96)m (96)m | (87)m= | 20.55 | 20.65 | 20.78 | 20.93 | 20.99 | 21 | 21 | 21 | 21 | 20.93 | 20.74 | 20.54 | | (87) |
| (88)m 20.29 20.3 20.31 20.32 20.34 20.34 20.33 20.32 20.31 20.3 (88) Utilisation factor for gains for rest of dwelling, h2, m (see Table 9a) (99)m 0.86 0.95 0.92 0.8 0.51 0.41 0.28 0.31 0.52 0.81 0.95 0.88 (99) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m 19.71 19.85 0.04 20.44 20.34 20.34 20.33 20.25 0.98 (99) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) Apply adjustment to the mean internal temperature form Table 4e, where appropriate (93) (93) Septe heating requirement 20.64 20.62 20.63 20.62 20.54 20.32 20.07 (93) Septe heating factor for gains bing Table 9a (94)m (95) (96)m (96)m (96)m (96)m (96)m (96)m (96)m (96)m (96)m | Temp | erature | during h | eating p | eriods ir | n rest of | dwelling | from Ta | able 9, T | h2 (°C) | | | | | |
| (9)m= 0.88 0.96 0.92 0.8 0.61 0.41 0.28 0.31 0.52 0.81 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c): (80)m= 19.71 19.85 20.04 20.24 20.31 20.34 20.32 10.32 10.99 19.71 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (91) (92) (92) (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 20.07 20.19 20.38 20.54 20.62 20.63 20.62 20.54 20.32 20.07 (93) Set to the mean internal temperature from Table 4e, where appropriate (93)m= 20.07 (93) 20.37 20.37 20.38 20.67 20.43 20.42 20.32 20.07 (93) Set to the mean internal temperature obtained at step 11 of Table 9b, so that T,m=(76)m and re-calculate the utilisation factor for gains, hm: (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (95) (94) <td></td> <td>1</td> <td></td> <td></td> <td>r</td> <td>-</td> <td><u> </u></td> <td>1</td> <td>i</td> <td><u>, , , , , , , , , , , , , , , , , , , </u></td> <td>20.32</td> <td>20.31</td> <td>20.3</td> <td></td> <td>(88)</td> | | 1 | | | r | - | <u> </u> | 1 | i | <u>, , , , , , , , , , , , , , , , , , , </u> | 20.32 | 20.31 | 20.3 | | (88) |
| (9)m= 0.88 0.96 0.92 0.8 0.61 0.41 0.28 0.31 0.52 0.81 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c): (80)m= 19.71 19.85 20.04 20.24 20.31 20.34 20.32 10.32 10.99 19.71 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (91) (92) (92) (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 20.07 20.19 20.38 20.54 20.62 20.63 20.62 20.54 20.32 20.07 (93) Set to the mean internal temperature from Table 4e, where appropriate (93)m= 20.07 (93) 20.37 20.37 20.38 20.67 20.43 20.42 20.32 20.07 (93) Set to the mean internal temperature obtained at step 11 of Table 9b, so that T,m=(76)m and re-calculate the utilisation factor for gains, hm: (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (95) (94) <td>Utilisa</td> <td>ation fac</td> <td>tor for a</td> <td>ains for</td> <td>rest of d</td> <td>welling</td> <td>h2 m (se</td> <td>e Table</td> <td>9a)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | Utilisa | ation fac | tor for a | ains for | rest of d | welling | h2 m (se | e Table | 9a) | | | | | | |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | | | | 1 | - | <u> </u> | 0.52 | 0.81 | 0.95 | 0.98 | | (89) |
| (8))m= 19.71 19.85 20.04 20.24 20.31 20.34 20.33 20.25 19.99 19.71 (90) ILA = Living area = (4) * 0.43 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92)m= 20.07 20.19 20.38 20.64 20.62 20.62 20.62 20.64 20.32 20.07 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 3. Space heating requirement (93) Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate (94) (94) (94) (94) (94) (94) (94) (94) (94) (95) (96) (96) (97) (93) (93) (94) (94) (95) (96) (96) (96) (96) (96) (96) (96) (96) (97) (93) (93) (94) (94) (94) (94) (94) (95) (96) (96) (97) (93) (93) (94) (94) (96) (96) (97) (93) | | internel | tompor | oturo in | the reat | | ing T2 (f | | 1 | l 7 in Tobl | | | | | |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | | r | 1 | r <u> </u> | 1 | r – | r | <u> </u> | 19 99 | 19.71 | | (90) |
| | (00)11- | 10.71 | 10.00 | 20.04 | 20.24 | 20.01 | 20.04 | 20.04 | 20.04 | | | | | 0.43 | |
| (92)me 20.07 20.19 20.32 20.54 20.62 20.62 20.54 20.32 20.07 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me 20.07 20.19 20.36 20.54 20.62 20.54 20.32 20.07 (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, km: (94) (94) (94) (94) (95) (94) (94) (94) (94) (95)me (94) (95)me (96)me (96)me (97) 0.96 0.92 0.81 0.63 0.43 0.3 0.54 0.82 0.95 0.98 (94) Utilisation factor for gains, hm: (96)me 49.24 52.3 48.87 38.7 258.7 172.97 180.58 282.05 407.88 461.47 482.1 (95) (96)me 43 4.9 6.5 8.9 11.7 14.8 16.6 16.4 14.4 10.66 7.1 4.2 (96) (97) (97) Space heating requirement | | | | | | | | | <i></i> | | | . . | <i>,</i> | 0.40 | |
| Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 20.07 20.19 20.36 20.62 20.62 20.62 20.54 20.32 20.07 (93) Sepace 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 fullisation factor for gains, hm: (94) Useful gains, hm: (94) (94) (94) | | | | , | 1 | I | 1 <u> </u> | I | r` | r | 00.54 | | | | (02) |
| (83)m- 20.07 20.19 20.32 20.61 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.61 20.62 20.61 20.62 20.61 20.62 20.61 20.62 20.61 20.62 20.61 20.62 20.62 20.62 20.61 20.61 20.62 20.61 20.62 20.61 20.62 20.61 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 20.62 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>20.32</td><td>20.07</td><td></td><td>(92)</td></t<> | | | | | | | | | | | | 20.32 | 20.07 | | (92) |
| 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 using Table 9a (94) Using Table 9a Utilisation factor for gains using Table 9a (94) Using Table 9a (95) Using Table 9a (96) Using Table 9a Utilisation factor for gains using Table 9a (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98) Space heating requirement in kWh/m?/year (98) Space heating | | <u> </u> | | | r | <u> </u> | r | 1 | r | · · · | · · | 20.22 | 20.07 | | (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 (4) Uain Feb Mar Apr May Jun Jun Aug Sep Oct Nov Dec (94)m = 0.97 0.90 0.92 0.81 0.63 0.43 0.3 0.33 0.54 0.82 0.93 0.93 Utilisation factor for gains, hm: (94) (94) (94) (94) (95) (94) (94) (95) (94) (95) (94) (95) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (95) (94) (95) (94) (94) (95) (94) (95) (94) (95) (94) (95) (95) (96) (97) (97) (97) (92) (96) (97) (97) (96) (97) (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (96) (98) (94) (94) (94) (94) (94) (94) (94)< | | | | | | 20.0 | 20.02 | 20.02 | 20.03 | 20.02 | 20.34 | 20.32 | 20.07 | | (30) |
| the utilisation factor for gains using Table 9a 49 49 Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94) 0.83 0.43 0.3 0.33 0.54 0.82 0.95 0.98 0.98 0.98 0.98 0.99 0.98 0.99 0.98 0.99 <t< td=""><td></td><td></td><td></td><td></td><td></td><td>re obtair</td><td>ned at st</td><td>en 11 of</td><td>Table 9</td><td>n so tha</td><td>t Ti m=('</td><td>76)m an</td><td>d re-calc</td><td>ulate</td><td></td></t<> | | | | | | re obtair | ned at st | en 11 of | Table 9 | n so tha | t Ti m=(' | 76)m an | d re-calc | ulate | |
| Utilisation factor for gains, hm: (94)m = 0.97 0.96 0.92 0.81 0.63 0.43 0.3 0.33 0.54 0.82 0.98 (94) Useful gains, hm: (94)m = (94)m = (94)m = (95)m = (94)m × (84)m (94) (94)m × (84)m (94) (95)m = 499.24 523.37 525.23 488.47 388.7 258.7 172.97 180.58 282.06 407.88 461.47 482.1 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.5 6.5 9.9 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 × [(93)m – (96)m] (97) Space heating requirement for each month, kWh/month = 0.024 × [(97)m – (95)m] × (41)m (98) Space heating requirement in kWh/m²/year 11.39 (99) Space heating: 0 0 0 2.29 175.54 Fraction of space heat from main system 1 (204) = (202) × [1 – (201) = | | | | | | | | | | o, oo tha | ι ι Π,ΠΙ-(| r ojin un | | alato | |
| (94)m= 0.97 0.96 0.92 0.81 0.63 0.43 0.3 0.33 0.54 0.82 0.98 0.98 Useful gains, hmGm, W = (94)m x (84)m (95)m= 449.24 523.37 525.23 483.87 38.7 258.7 172.97 180.58 282.05 407.88 461.47 452.1 (95) Monthly average external temperature from Table 8 (96)m = 4.9 6.5 8.9 11.7 14.6 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 - (95)m] (97)m 728.66 703.58 634.18 517.91 39.39.2 258.94 172.98 180.6 283.43 440.03 591.51 718.05 (97) Space heating requirement or each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 171.43 121.1 81.06 24.51 3.8.8 0 0 23.22 93.62 175.54 (98) Space heating requirement in kWh/m?/year 0 0 2.22 = 1 - (201) = 1 (202) 11.39 (99) 93.7 (201) 11.39 | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Useful gains, hmGrn, W = (94)m x (84)m (95)m 499.24 523.37 525.23 483.87 388.7 258.7 172.97 180.58 282.05 407.88 461.47 482.1 (95)m Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 148.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)m (97)m 723.66 703.58 634.18 517.91 393.92 258.94 172.98 180.6 283.43 440.03 591.51 718.05 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (97)m (95)m (43) 42.11 81.06 24.51 3.88 0 0 0 23.92 93.62 175.54 (98) Space heating requirement in kWh/m²/year Total per year (kWh/year) = Sum(98), 48.02 = 695.07 (98) (98) Space heating requirements – Individual heating systems including micro-CHP) 11.39 (99) 99 Space heating requirement in kWh/m²/year 0 (201) = 1 (202) 1 (202) Fraction of space heat from main system 1 (202) = 1 - (201) = 1 (202) Fraction of space heat from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.7 (206) 0 (201) Fraction of space heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) 0 (208) Jan Feb Mar Apr | Utilisa | ation fac | tor fo <mark>r g</mark> | ains, hm | 1: | | | | | | | | | | |
| (95)m= 499.24 523.37 525.23 483.87 386.7 258.7 172.97 180.58 282.05 407.88 461.47 482.1 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.3 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 × [(93)m – (96)m] (97)m = 729.66 703.58 634.18 517.91 393.92 258.94 172.98 180.6 283.43 440.03 591.51 716.05 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98) (99) 93.62 175.54 (98) Space heating requirement in kWh/m²/year 11.39 (99) 93. 59.07 (98) Space heating: 11.39 (99) 93. (202) = 1 - (201) = 1 (202) Fraction of space heat from main system (s) (202) = 1 - (201) = 1 (202) 1 (203) = 1 (204) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1< | (94)m= | 0.97 | 0.96 | 0.92 | 0.81 | 0.63 | 0.43 | 0.3 | 0.33 | 0.54 | 0.82 | 0.95 | 0.98 | | (94) |
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| Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m - (96)m] (97)m = 729.66 (703.58 634.18 517.91 393.92 258.94 172.98 180.6 283.43 440.03 591.51 718.05 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 171.43 121.1 81.06 283.43 440.03 591.51 718.05 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 171.43 121.1 81.06 24.51 3.88 0 0 0 23.92 93.62 175.54 Total per year (kWh/year) = Sum(98)ss.12 695.07 (98) Space heating requirement in kWh/m²/year 11.39 (99) 9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: 0 (201) Fraction of space heat from main system(S) (202) = 1 - (201) = 1 (202) 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) (204) (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 | | <u> </u> | | | | | | | <u> </u> | | | | | 1 | (00) |
| (97)m= 729.66 703.58 634.18 517.91 393.92 258.94 172.98 180.6 283.43 440.03 591.51 718.05 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 171.43 121.1 81.06 24.51 3.88 0 0 0 23.92 93.62 175.54 Total per year (kWh/year) = Sum(98)so.12 695.07 (98) Space heating requirement in kWh/m²/year 11.39 (99) 93.7 (201) Fraction of space heat from secondary/supplementary system 0 (202) = 1 - (201) = 1 (202) Fraction of space heat from main system 1 (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year feb Mar | | _ | | | | | | | | | | 7.1 | 4.2 | | (96) |
| Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m= 171.43 121.1 81.06 24.51 3.88 0 0 0 23.92 93.62 175.54 Total per year (kWh/year) = Sum(98)scr Space heating requirement in kWh/m²/year 93.62 175.54 Space heating requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) 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 93.7 (206) Efficiency of secondary/supplementary heating system, % 0 (208) 171.43 121.1 81.06 24.51 3.88 0 0 0 23.92 93.62 175.54 (211) If (143 121.1 81.06 24.51 3.88 0 <td></td> <td></td> <td></td> <td></td> <td>· · ·</td> <td>r</td> <td>1</td> <td><u> </u></td> <td><u> </u></td> <td></td> <td>ř – – –</td> <td>E01 E1</td> <td>710.05</td> <td> </td> <td>(07)</td> | | | | | · · · | r | 1 | <u> </u> | <u> </u> | | ř – – – | E01 E1 | 710.05 | | (07) |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | | | | | | | | | | 718.05 | | (37) |
| $Total per year (kWh/year) = Sum(98)_{1.53.12} = 695.07 (98)$ Space heating requirement in kWh/m²/year $11.39 (99)$ 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 $93.7 (206)$ Efficiency of secondary/supplementary heating system, % $0 (208)$ $\boxed{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year$ Space heating requirement (calculated above) $\boxed{171.43 121.1 81.06 24.51 3.88 0 0 0 0 23.92 93.62 175.54}$ $(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$ (211) | | | | | | Î | i i | Î | Î | | | | 175 54 | | |
| Space heating requirement in kWh/m²/year11.39(99) Space heating: Fraction of space heat from secondary/supplementary systemFraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ Efficiency of main space heating system 1 93.7 Efficiency of secondary/supplementary heating system, % 0 $\sqrt{3.7}$ (208) $\sqrt{3.7}$ (208) $\sqrt{3.7}$ (206) Efficiency of secondary/supplementary heating system, % 0 $\sqrt{3.7}$ $\sqrt{206}$ $\sqrt{3.7}$ $\sqrt{3.88}$ $\sqrt{3.82}$ $\sqrt{3.92}$ $\sqrt{3.92}$ $\sqrt{3.62}$ $\sqrt{3.92}$ $\sqrt{3.62}$ 3 | (00) | | | | | 0.00 | | , s | - | | | | | 695.07 | (98) |
| 9a. Energy requirements – Individual heating systems including micro-CHP)Space heating: Fraction of space heat from secondary/supplementary system0(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 93.7 (206)Efficiency of secondary/supplementary heating system, %0(208)JanFebMarAprMayJunJulAugSepOctNovDecSpace heating requirement (calculated above) 171.43 121.1 81.06 24.51 3.88 000 23.92 93.62 175.54 (211) m = {[(98)m x (204)] } x 100 ÷ (206)(211)(211)(211)(211)(211) | Creek | - heatin | | | L() / /b //mo | 24.000 | | | 1010 | i por your | (itter#jour |) – O um(o | C /15,912 - | | |
| Space heating: Fraction of space heat from secondary/supplementary system0(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 93.7 (206)Efficiency of secondary/supplementary heating system, %0(208) $\sqrt{$ JanFebMarAprMayJunJulAugSepOctNovDecSpace heating requirement (calculated above) 171.43 121.1 81.06 24.51 3.88 000 23.92 93.62 175.54 (211) m = {[(98)m x (204)] } x 100 ÷ (206)(211) 182.96 129.25 86.51 26.16 4.14 000 25.53 99.92 187.35 | | | | | | • | | | | | | | l | 11.39 | (99) |
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| Efficiency of main space heating system 1 93.7 (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) 171.43 121.1 81.06 24.51 3.88 0 0 0 23.92 93.62 175.54 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 182.96 129.25 86.51 26.16 4.14 0 0 0 25.53 99.92 187.35 | | | | | - | . , | | | | | (222)] | | | 1 | |
| 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) 171.43 121.1 81.06 24.51 3.88 0 0 0 23.92 93.62 175.54 (211) $(211)m = \{[(98)m x (204)] \} x 100 \div (206)$ (211) 182.96 129.25 86.51 26.16 4.14 0 0 0 25.53 99.92 187.35 | | | | - | - | | | | (204) = (2 | 02) × [1 – | (203)] = | | ļ | 1 | (204) |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | Efficie | ency of r | nain spa | ace heat | ing syste | em 1 | | | | | | | | 93.7 | (206) |
| Space heating requirement (calculated above) 171.43 121.1 81.06 24.51 3.88 0 0 0 23.92 93.62 175.54 (211)m = {[(98)m x (204)] } x 100 ÷ (206) (211) 182.96 129.25 86.51 26.16 4.14 0 0 0 25.53 99.92 187.35 | Efficie | ency of s | seconda | ry/suppl | ementar | y heatin | g systen | า, % | | | | | | 0 | (208) |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | kWh/y | /ear |
| $(211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $182.96 129.25 86.51 26.16 4.14 0 0 0 0 25.53 99.92 187.35 $ (211) | Space | e heating | g require | ement (c | alculate | d above |) | | | | | | | | |
| 182.96 129.25 86.51 26.16 4.14 0 0 0 0 25.53 99.92 187.35 | | 171.43 | 121.1 | 81.06 | 24.51 | 3.88 | 0 | 0 | 0 | 0 | 23.92 | 93.62 | 175.54 | | |
| | (211)m | n = {[(98] |)m x (20 | 4)] | 00 ÷ (20 | 06) | | | | | | | | | (211) |
| Total (kWh/year) =Sum(211) _{15,1012} = 741.81 (211) | | 182.96 | 129.25 | 86.51 | 26.16 | 4.14 | 0 | 0 | | | | | | | |
| | | | | | | | | | Tota | l (kWh/yea | ar) =Sum(2 | 2 11) _{15,1012} | - | 741.81 | (211) |

Space heating fuel (secondary), kWh/month

| $= \{[(98)m \times (201)]\} \times 100 \div (201)\}$ | 08) | | | | | | | | | | |
|---|--------------------------|-----------|------------------|------------|------------|------------|------------------------|---------------------------------|---------------------|--------------------|--------|
| (215)m= 0 0 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | _ |
| | | | | | Tota | l (kWh/yea | ar) =Sum(2 | 2 15) _{15,1012} | 2 | 0 | (215) |
| Water heating | | | | | | | | | | | |
| Output from water heater (calc 114.48 101.15 106.99 | 97.46 | 96.13 | 86.17 | 83.47 | 91.5 | 91.29 | 101.87 | 105.84 | 111.5 |] | |
| Efficiency of water heater | | | | | I | | | | | 87.2 | (216) |
| (217)m= 89.27 89.07 88.68 | 87.88 | 87.33 | 87.2 | 87.2 | 87.2 | 87.2 | 87.84 | 88.81 | 89.31 | | (217) |
| Fuel for water heating, kWh/m $(219)m = (64)m \times 100 \div (217)m$ | | | | | | - | | - | | _ | |
| (219)m= 128.24 113.56 120.65 | 110.9 | 110.08 | 98.82 | 95.72 | 104.93 | 104.69 | 115.96 | 119.18 | 124.85 | | _ |
| | | | | | Tota | I = Sum(21 | 19a) ₁₁₂ = | | | 1347.59 | (219) |
| Annual totals | avetam | 4 | | | | | k | Wh/year | • | kWh/year | 1 |
| Space heating fuel used, main | system | I | | | | | | | | 741.81 |] |
| Water heating fuel used | | | | | | | | | | 1347.59 | J |
| Electricity for pumps, fans and | l electric l | keep-hot | | | | | | | | _ | |
| mechanical ventilation - balar | nced, ext | ract or p | ositive ir | nput fror | n outside | Э | | | 97.96 | | (230a) |
| central heating pump: | | | | | | | | | 30 |] | (230c) |
| boi <mark>ler wi</mark> th a fan-assisted flue | | | | | | | | | 45 | | (230e) |
| Total electricity for the above, | kWh/yea | r | | | sum | of (230a). | <mark>(2</mark> 30g) = | : | | 172.96 | (231) |
| Electricity for lighting | | | | | | | | | | 291.56 | (232) |
| Electricity generated by PVs | | | | | | | | | | -259.09 | (233) |
| Total delivered energy for all u | . <mark>ses (</mark> 211 |)(221) | + (231) | + (232) | (237b) | _ | | | | 2294.83 | (338) |
| 10a. Fuel costs - individual h | eating sy | stems: | | | | | | - | | | 1 |
| | | | Fu | ما | | | Fuel P | rice | | Fuel Cost | |
| | | | | /h/year | | | (Table | | | £/year | |
| Space heating - main system | 1 | | (211 | l) x | | | 3.4 | 8 | x 0.01 = | 25.81 | (240) |
| Space heating - main system 2 | 2 | | (213 | 3) x | | | 0 | | x 0.01 = | 0 | (241) |
| Space heating - secondary | | | (215 | 5) x | | | 13. | 19 | x 0.01 = | 0 | (242) |
| Water heating cost (other fuel) |) | | (219 | 9) | | | 3.4 | 18 | x 0.01 = | 46.9 | (247) |
| Pumps, fans and electric keep | o-hot | | (231 | 1) | | | 13. | 19 | x 0.01 = | 22.81 | (249) |
| (if off-peak tariff, list each of (2 Energy for lighting | 230a) to (2 | 230g) se | parately (232 | | licable a | nd apply | fuel pri 13. | | ding to x 0.01 = | Table 12a 38.46 | (250) |
| Additional standing charges (T | Table 12) | | | | | | | | | 120 | (251) |
| | | | one | of (233) t | o (235) x) | | 13. | 19 | x 0.01 = | 0 | (252) |
| Appendix Q items: repeat lines | s (253) aı | nd (254) | as need | led | | | L | | | L | 4 |
| Total energy cost | . / | . , | 247) + (25 | | = | | | | | 253.98 | (255) |
| 11a SAP rating - individual h | opting ov | etome | | | | | | | | | |

| Energy cost deflator (Table 12) | | | 0.42 (256) |
|--|-------------------------------|--------------------------------------|---------------------------------|
| Energy cost factor (ECF) [(25 | 5) x (256)] ÷ [(4) + 45.0] = | | 1.01 (257) |
| SAP rating (Section 12) | | | 85.96 (258) |
| 12a. CO2 emissions – Individual heating sy | stems including micro-CHP | | |
| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
| Space heating (main system 1) | (211) x | 0.216 = | 160.23 (261) |
| Space heating (secondary) | (215) x | 0.519 = | 0 (263) |
| Water heating | (219) x | 0.216 = | 291.08 (264) |
| Space and water heating | (261) + (262) + (263) + (2 | 64) = | 451.31 (265) |
| Electricity for pumps, fans and electric keep | -hot (231) x | 0.519 = | 89.76 (267) |
| Electricity for lighting | (232) x | 0.519 = | 151.32 (268) |
| Energy saving/generation technologies Item 1 | | 0.519 = | -134.47 (269) |
| Total CO2, kg/year | | sum of (265)(271) = | 557.93 (272) |
| CO2 emissions per m ² | | (272) ÷ (4) = | 9.15 (273) |
| El rating (section 14) | | | 93 (274) |
| 13a. Primary Energy Space heating (main system 1) | Energy kWh/year (211) x | Primary factor | P. Energy kWh/year |
| Space heating (secondary) | (215) × | 3.07 = | 0 (263) |
| Energy for water heating | (219) x | 1.22 = | 1644.06 (264) |
| Space and water heating | (261) + (262) + (263) + (2 | 64) = | 2549.07 (265) |
| Electricity for pumps, fans and electric keep | -hot (231) x | 3.07 = | 530.97 (267) |
| Electricity for lighting | (232) x | 0 = | 895.09 (268) |
| Energy saving/generation technologies Item 1 | | 3.07 = | -795.39 (269) |
| 'Total Primary Energy | | sum of (265)(271) = | 3179.74 (272) |
| Primary energy kWh/m²/year | | (272) ÷ (4) = | 52.13 (273) |

| | | ι | User D | etails: | | | | | | |
|---|---|-------------------------|------------|------------------|-------------|------------------|-----------------------|--------------|---------------------------------------|---------------------|
| Assessor Name: Software Name: | Stroma FSAP 201 | | Ş | Stroma Softwa | re Ver | sion: | · Be Gree | | n: 1.0.5.41 | |
| Address : | 106 Bexley Road , E | | | auress. | | 20 36 - | De Gleo | GII | | |
| 1. Overall dwelling dimen | • | | , 001 | | | | | | | |
| Ground floor | | | Area | · , | (1a) x | Av. He | ight(m) 2.7 | (2a) = | Volume(m³) 164.7 | (3a) |
| Total floor area TFA = (1a) |)+(1b)+(1c)+(1d)+(1e) |)+(1n) | | 61 | (4) | | | | | |
| Dwelling volume | | | | | (3a)+(3b) | +(3c)+(3d | l)+(3e)+ | .(3n) = | 164.7 | (5) |
| 2. Ventilation rate: | | | | - 4 | | 4 - 4 - 1 | | | | |
| Number of chimneys Number of open flues | | econdary eating 0 | + | 0 0 |] = [| total 0 0 | | 40 = 20 = | m ³ per hour | (6a) (6b) |
| Number of intermittent fan | s | | | | | 0 | x 1 | 10 = | 0 |](7a) |
| | 5 | | | | | | | 10 = | - | <u> </u> |
| Number of passive vents | | | | | | 0 | | | 0 | (7b) |
| Number of flueless gas fire | | | | | L | 0 | | | o anges per ho | ur |
| Infiltration due to chimneys | | | | | | 0 | | ÷ (5) = | 0 | (8) |
| If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre | e dw <mark>elling</mark> (ns) 25 for steel or timber f | rame or 0 | .35 for | masonr | y constr | | | •1]x0.1 = | 0 0 0 | (9) (10) (11) |
| deducting areas of opening | | N 0.4 | <i>,</i> . | | | | | | | - |
| If suspended wooden flo | , | ed) or 0.1 | (seale | d), else (| enter 0 | | | | 0 | (12) |
| If no draught lobby, ente Percentage of windows | | rinnod | | | | | | | 0 | (13) |
| Window infiltration | and doors draught su | ipped | (| 0.25 - [0.2 | x (14) ÷ 1 | 001 = | | | 0 | (14) (15) |
| Infiltration rate | | | | (8) + (10) - | | - | + (15) = | | 0 | (16) |
| Air permeability value, q | 50, expressed in cub | ic metres | | | | | | area | 4 | (17) |
| If based on air permeabilit | | | • | • | • | | • | | 0.2 | (18) |
| Air permeability value applies | if a pressurisation test has | been done | or a deg | ree air per | meability i | is being us | sed | | | |
| Number of sides sheltered | | | | (00) 4 5 | 0.075(4 | 0)1 | | | 1 | (19) |
| Shelter factor | | | | (20) = 1 - [| | 9)] = | | | 0.92 | (20) |
| Infiltration rate incorporation | - | | | (21) = (18) | x (20) = | | | | 0.19 | (21) |
| Infiltration rate modified fo | | i | | • | 0 | 0.1 | | Du | l | |
| | Mar Apr May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly average wind spe | | 20 | 20 | 27 | л | 10 | A E | 47 | l | |
| (22)m= 5.1 5 4 | .9 4.4 4.3 | 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 | | |
| Wind Factor (22a)m = (22) | 1 1 1 | | | | | | | | I | |
| (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 | | |

| Adjust | ed infiltra | ation rat | e (allow | ing for sl | nelter an | d wind s | peed) = | (21a) x | (22a)m | | | | - | |
|---------------------|------------------------------|-----------|------------|---------------------|-------------------------|-------------|----------------|------------------|--------------|---------------|-------------------|----------------------|-------------------|--------|
| | 0.24 | 0.23 | 0.23 | 0.2 | 0.2 | 0.18 | 0.18 | 0.17 | 0.19 | 0.2 | 0.21 | 0.22 | | |
| | <i>ate effec</i> echanica | | • | rate for t | he appli | cable ca | se | | | | | | | (00 -) |
| | | | | andix N (2 | 23b) = (23a | a) x Emy (e | austion (N | (5)) other | nuico (23h |) = (23a) | | | 0.5 | (23a) |
| | | | | | allowing f | | | | |) = (200) | | | 0.5 | (23b) |
| | | | - | - | - | | | | | 2 15) | | (00 s) | 79.05 | (23c) |
| | | 0.34 | i | 0.31 | with hea | 0.28 | 0.28 | 1R) (24a 0.28 | 0.29 | , <u>,</u> | 23D) × [* 0.31 | 0.32 |) ÷ 100]] | (24a) |
| (24a)m= | | | 0.33 | | | | | | | 0.3 | | 0.32 | | (244) |
| , | | | 1 | | without | 1 | <i>,</i> , | , ` | , , | r í | , <u> </u> | | 1 | (24b) |
| (24b)m= | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | J | (240) |
| , | | | | | or positiv c) = (23b | | | | | 5 × (23b |) | - | _ | |
| (24c)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24c) |
| , | | | | | se positiv b)m othe | | | | | 0.5] | | | | |
| (24d)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24d) |
| Effe | ctive air | change | rate - er | nter (24a |) or (24b | o) or (24 | c) or (24 | d) in box | (25) | | | _ | _ | |
| (25)m= | 0.34 | 0.34 | 0.33 | 0.31 | 0.3 | 0.28 | 0.28 | 0.28 | 0.29 | 0.3 | 0.31 | 0.32 | | (25) |
| 3 He | at losse | s and he | at loss | paramet | er. | | | | | | | _ | | |
| ELEN | | Gros | | Openin | | Net Ar | ea | U-valu | Je | AXU | | k-value | | AXk |
| | | area | | | 19- 12 | A ,r | | W/m2 | | (W/I | K) | kJ/m ² ·l | | kJ/K |
| Doo <mark>rs</mark> | | | | | | 1.91 | x | 1 | = | 1.91 | | | | (26) |
| Windo | <mark>ws</mark> Type | :1 | | | | 1.71 | x1/ | /[1/(1.2)+ | 0.04] = | 1.96 | | | | (27) |
| Windo | ws Type | 2 | | | | 1.71 | x1/ | /[1/(1.2)+ | 0.04] = | 1.96 | | | | (27) |
| Windo | ws Type | 3 | | | | 4.09 | x1/ | /[1/(1.2)+ | 0.04] = | 4.68 | 5 | | | (27) |
| Walls - | Type1 | 66.4 | 2 | 11.1 | 3 | 55.29 |) X | 0.16 | | 8.85 | | | | (29) |
| Walls | Type2 | 7.8 | 3 | 0 | | 7.83 | x | 0.15 | = | 1.18 | | | \exists | (29) |
| Total a | area of e | lements | , m² | | | 74.25 | 5 | | I | | L | | | (31) |
| Party v | | | | | | 32.13 | | 0 | | 0 | | | | (32) |
| Party f | loor | | | | | 61 | | | (| | | | $\exists \vdash$ | (32a) |
| Party of | | | | | | 61 | | | | | L | | | (32b) |
| • | - | roof wind | ows, use e | effective wi | indow U-va | | ated using | formula 1 | /[(1/U-valu | ıe)+0.04] a | L as given in | paragraph | h 3.2 | (020) |
| | | | | | ls and part | | 9 | | | , , . | 5 | 1 | | |
| Fabric | heat los | s, W/K : | = S (A x | U) | | | | (26)(30) | + (32) = | | | | 22.49 | (33) |
| Heat c | apacity | Cm = S(| (Axk) | | | | | | ((28). | (30) + (32 | 2) + (32a). | (32e) = | 12222. | 7 (34) |
| Therm | al mass | parame | ter (TMI | ⁻ = Cm - | ÷ TFA) ir | n kJ/m²K | | | Indica | tive Value | : Medium | | 250 | (35) |
| | ign assess used instea | | | | constructi | ion are not | t known pr | ecisely the | e indicative | e values of | TMP in Ta | able 1f | | |
| Therm | al bridge | es : S (L | x Y) cal | culated | using Ap | pendix ł | < | | | | | | 5.25 | (36) |
| | s of therma abric he | | are not kr | own (36) = | = 0.05 x (3 | 1) | | | (33) + | (36) = | | | 27.75 | (37) |
| | | | alculated | d monthly | v | | | | | = 0.33 × (| 25)m x (5) |) | | (3)) |
| | Jan | Feb | Mar | Apr | , May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |] | |
| | | | | | | | | . v | | | | i | 4 | |

| (38)m= | 18.51 | 18.26 | 18.01 | 16.75 | 16.5 | 15.25 | 15.25 | 14.99 | 15.75 | 16.5 | 17.01 | 17.51 | | (38) |
|------------|----------------------|---------------------------------|--------------------------|----------------------------|----------------|-------------|------------|-------------|-----------------------|---------------------------|------------------------|------------|----------------------|----------|
| Heat tr | ansfer o | coefficie | nt, W/K | | | | | | (39)m | = (37) + (3 | 38)m | | | |
| (39)m= | 46.26 | 46.01 | 45.76 | 44.5 | 44.25 | 42.99 | 42.99 | 42.74 | 43.49 | 44.25 | 44.75 | 45.25 | | |
| Heat lo | oss para | ameter (H | HLP), W | /m²K | | | | | | Average = = (39)m ÷ | Sum(39)1. • (4) | 12 /12= | 44.44 | (39) |
| (40)m= | 0.76 | 0.75 | 0.75 | 0.73 | 0.73 | 0.7 | 0.7 | 0.7 | 0.71 | 0.73 | 0.73 | 0.74 | | |
| Numbe | er of day | /s in mo | nth (Tab | le 1a) | | | | | , | Average = | Sum(40)1. | 12 /12= | 0.73 | (40) |
| | Jan | Feb | Mar | Apr | Мау | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (41)m= | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | | (41) |
| | | | | | | | | | | | | | | |
| 4. Wa | ter hea | ting ene | rgy requ | irement: | | | | | | | | kWh/yea | ar: | |
| if TF | A > 13. | upancy, 9, N = 1 9, N = 1 | | : [1 - exp | (-0.0003 | 849 x (TF | FA -13.9) |)2)] + 0.(|)013 x (⁻ | TFA -13. | | 01 | | (42) |
| | | | | ge in litre | | | | | | | | .93 | | (43) |
| | | - | | usage by : r day (all w | | - | - | to achieve | a water us | se target o | f | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Hot wate | | | | ach month | | | | <u> </u> | Ocp | 000 | 1100 | | | |
| (44)m= | 90.13 | 86.85 | 83.57 | 80.29 | 77.02 | 73.74 | 73.74 | 77.02 | 80.29 | 8 <mark>3.57</mark> | 86.85 | 90.13 | | |
| | | | | | | | | | | | n(44) ₁₁₂ = | | 9 <mark>83.18</mark> | (44) |
| Energy o | content of | ^t hot water | used - cal | lculated mo | onthly $= 4$. | 190 x Vd,n | n x nm x D | 0Tm / 3600 |) kWh/mor | nth (see Ta | bles 1b, 1 | c, 1d) | | |
| (45)m= | 133.65 | 116.89 | 120.62 | 105.16 | 100.91 | 87.07 | 80.69 | 92.59 | 93.7 | 109.19 | 119.19 | 129.44 | | _ |
| lf instant | aneous w | vater heati | ng at point | t of use (no | hot water | r storage), | enter 0 in | boxes (46 | | Tota <mark>l = S</mark> u | m(45) ₁₁₂ = | = | 1289.11 | (45) |
| (46)m= | 20.05 | 17.53 | 18.09 | 15.77 | 15.14 | 13.06 | 12.1 | 13.89 | 14.05 | 16.38 | 17.88 | 19.42 | | (46) |
| · · · | storage | | | | | | | | | | | | | . , |
| Storag | e volum | ne (litres) |) includir | ng any so | olar or W | /WHRS | storage | within sa | ame ves | sel | | 0 | | (47) |
| | | • | | ank in dw | • | | | · · | | | | | | |
| | ise if no storage | | hot wate | er (this in | ICludes I | nstantar | ieous co | mbi boil | ers) ente | er '0' in (| 47) | | | |
| | - | | eclared I | oss facto | or is kno | wn (kWł | n/day): | | | | | 0 | | (48) |
| | | | m Table | | | , | • • | | | | | 0 | | (49) |
| Energy | lost fro | om water | r storage | e, kWh/ye | ear | | | (48) x (49) |) = | | | 0 | | (50) |
| , | | | | cylinder I | | | | | | | | | | |
| | | - | s factor fi see secti | rom Tabl | e 2 (kW | h/litre/da | iy) | | | | | 0 | | (51) |
| | • | from Ta | | 011 4.0 | | | | | | | | 0 | | (52) |
| Tempe | rature f | actor fro | m Table | 2b | | | | | | | | 0 | | (53) |
| Energy | lost fro | om water | r storage | e, kWh/ye | ear | | | (47) x (51) | x (52) x (| 53) = | | 0 | | (54) |
| Enter | (50) or | (54) in (5 | 55) | | | | | | | | | 0 | | (55) |
| Water | storage | loss cal | culated | for each | month | | | ((56)m = (| 55) × (41) | m | | | | |
| (56)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (56) |
| If cylinde | er contain: | s dedicate | d solar sto | orage, (57)ı | m = (56)m | x [(50) – (| H11)] ÷ (5 | 0), else (5 | 7)m = (56) | m where (| H11) is fro | m Appendix | H | |
| (57)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (57) |

| Primary circui | • | , | | | (FO)~~ (| (50) . 00 | SE (44) | - | | | 0 | | (58) |
|-------------------------------|----------------------|----------------|-------------|-----------|-----------------------|--------------------------|------------------|---------------|--------------------------|---------------|-------------|---------------|------------|
| Primary circui (modified b | | | | ` | , , , | · · | ` ' | | r thermo | stat) | | | |
| (59)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (59) |
| Combi loss ca | alculated | for each | month (| (61)m = | (60) ÷ 36 | 35 × (41) |)m | | | | | | |
| (61)m= 24.91 | 22.5 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | | (61) |
| Total heat red | uired for | water h | eating ca | alculated | I for each | n month | (62)m = | 0.85 × | (45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= 158.57 | 139.4 | 145.54 | 129.27 | 125.82 | 111.18 | 105.6 | 117.5 | 117.81 | 134.11 | 143.3 | 154.35 | | (62) |
| Solar DHW input | calculated | using App | endix G or | Appendix | H (negativ | ve quantity | /) (enter '0 | if no sola | r contribut | ion to wate | er heating) | | |
| (add additiona | al lines if | FGHRS | and/or V | VWHRS | applies, | , see Ap | pendix (| G) | - | - | - | | |
| (63)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| FHRS 14.44 | 12.66 | 12.17 | 9.54 | 8.45 | 7.19 | 6.8 | 7.71 | 7.77 | 10.04 | 12.46 | 14.13 | | (63) (G2) |
| WWHRS -29.24 | -25.72 | -26.26 | -21.63 | -20.1 | -16.59 | -14.06 | -17.01 | -17.5 | -21.62 | -25.01 | -28.26 | | (63) (G10) |
| Output from v | vater hea | ter | | | | | | | | | | | |
| (64)m= 113.6 | 99.85 | 105.82 | 96.86 | 95.99 | 86.17 | 83.47 | 91.5 | 91.29 | 101.16 | 104.58 | 110.68 | | |
| | • | | | | | | Outp | out from w | ater heate | r (annual)₁ | 12 | 1180.98 | (64) |
| Hea <mark>t gains fro</mark> | om water | heating | , kWh/mo | onth 0.2 | 5 ´ [0.85 | × (45)m | + (61)m | n] + 0.8 x | k [(46)m | + (57)m | + (59)m |] | |
| (65)m= 50.67 | 44.49 | 46.34 | 40.99 | 39.78 | 34.98 | 33.06 | 37.01 | 37.18 | 42.54 | 45.66 | 49.27 | | (65) |
| in <mark>clude</mark> (57 |)m in calo | culation | of (65)m | only if c | ylinder is | s in th <mark>e</mark> (| dwelling | or hot w | ate <mark>r is fr</mark> | om com | munity h | eating | |
| 5. Internal g | ains (see | e Table { | 5 and 5a |): | | | | | | | | | |
| Met <mark>abolic</mark> gai | ns (Table | <u>5),</u> Wat | ts | | | | | | | | | | |
| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (66)m= 100.49 | 100.49 | 100.49 | 100.49 | 100.49 | 100.49 | 100.49 | 100.49 | 100.49 | 100.49 | 100.49 | 100.49 | | (66) |
| Lighting gains | s (calcula | ted in Ap | opendix | L, equat | ion L9 or | r L9a), a | lso see | Table 5 | | | - | | |
| <mark>(67)m=</mark> 16.51 | 14.66 | 11.93 | 9.03 | 6.75 | 5.7 | 6.16 | 8 | 10.74 | 13.64 | 15.92 | 16.97 | | (67) |
| Appliances ga | ains (calc | ulated ir | n Append | lix L, eq | uation L ² | 13 or L1 | 3a), also | see Ta | ble 5 | | | _ | |
| <mark>(68)</mark> m= 175.46 | 177.28 | 172.69 | 162.93 | 150.6 | 139.01 | 131.27 | 129.45 | 134.03 | 143.8 | 156.13 | 167.72 | | (68) |
| Cooking gain | s (calcula | ted in A | ppendix | L, equat | tion L15 | or L15a) |), also se | e Table | 5 | | | | |
| (69)m= 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | | (69) |
| Pumps and fa | ans gains | (Table s | 5a) | | | | | | | | | | |
| (70)m= 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | (70) |
| Losses e.g. e | vaporatic | on (nega | tive valu | es) (Tab | le 5) | | | | | | | | |
| (71)m= -80.39 | -80.39 | -80.39 | -80.39 | -80.39 | -80.39 | -80.39 | -80.39 | -80.39 | -80.39 | -80.39 | -80.39 | | (71) |
| Water heating | g gains (T | able 5) | | | •• | | | | - | • | | | |
| (72)m= 68.1 | 66.21 | 62.28 | 56.94 | 53.47 | 48.58 | 44.43 | 49.75 | 51.64 | 57.17 | 63.42 | 66.22 | | (72) |
| Total interna | l gains = | | | | (66) | m + (67)m | • n + (68)m + | + (69)m + | (70)m + (7 | 1)m + (72) | m | | |
| (73)m= 316.22 | 314.3 | 303.05 | 285.04 | 266.96 | 249.43 | 238 | 243.34 | 252.56 | 270.76 | 291.61 | 307.05 | | (73) |
| 6. Solar gair | IS: | | • | | | | | | 1 | | | | |
| Solar gains are | calculated | using sola | r flux from | Table 6a | and associ | ated equa | tions to co | nvert to th | ne applicat | le orientat | ion. | | |
| Orientation: | Access F Table 6d | | Area m² | | Flu: Tab | x ole 6a | Т | g_ able 6b | Та | FF able 6c | | Gains (W) | |

| North | 0.9x | 0.77 | × | 1.71 | × | 10.63 | × | 0.63 | x | 0.7 | = | 11.11 | (74) |
|-------|------|------|---------|------|---------|--------|---------|------|---|-----|---|-------|----------|
| North | 0.9x | 0.77 | x | 4.09 | x | 10.63 | x | 0.63 | x | 0.7 | = | 13.29 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | l x | 20.32 | × | 0.63 | x | 0.7 | = | 21.24 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | l x | 20.32 | x | 0.63 | x | 0.7 | = | 25.4 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | x | 34.53 | x | 0.63 | x | 0.7 | = | 36.09 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | l x | 34.53 | × | 0.63 | x | 0.7 | = | 43.16 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | x | 55.46 | x | 0.63 | x | 0.7 | = | 57.97 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 55.46 | x | 0.63 | x | 0.7 | = | 69.33 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | x | 74.72 | x | 0.63 | x | 0.7 | = | 78.09 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 74.72 | × | 0.63 | x | 0.7 | = | 93.39 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | × | 79.99 | × | 0.63 | x | 0.7 | = | 83.6 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 79.99 | × | 0.63 | x | 0.7 | = | 99.98 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | × | 74.68 | x | 0.63 | x | 0.7 | = | 78.05 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 74.68 | x | 0.63 | x | 0.7 | = | 93.34 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | × | 59.25 | x | 0.63 | x | 0.7 | = | 61.92 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 59.25 | × | 0.63 | x | 0.7 | = | 74.06 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | × | 41.52 | x | 0.63 | x | 0.7 | = | 43.39 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 41.52 | х | 0.63 | х | 0.7 | = | 51.89 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | x | 24.19 | x | 0.63 | x | 0.7 | = | 25.28 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | х | 24.19 | × | 0.63 | x | 0.7 | = | 30.24 | (74) |
| North | 0.9x | 0.77 | x | 1.71 | x | 13.12 | x | 0.63 | x | 0.7 | = | 13.71 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | × | 13.12 | x | 0.63 | x | 0.7 | = | 16.4 | (74) |
| North | 0.9x | 0.77 | × | 1.71 | x | 8.86 | × | 0.63 | x | 0.7 | = | 9.27 | (74) |
| North | 0.9x | 0.77 | × | 4.09 | x | 8.86 | × | 0.63 | x | 0.7 | = | 11.08 | (74) |
| South | 0.9x | 0.77 | × | 1.71 | × | 46.75 | × | 0.63 | x | 0.7 | = | 24.43 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | x | 76.57 | × | 0.63 | x | 0.7 | = | 40.01 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 97.53 | × | 0.63 | x | 0.7 | = | 50.97 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 110.23 | x | 0.63 | x | 0.7 | = | 57.61 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | x | 114.87 | x | 0.63 | x | 0.7 | = | 60.03 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 110.55 | × | 0.63 | x | 0.7 | = | 57.77 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | x | 108.01 | × | 0.63 | x | 0.7 | = | 56.45 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | x | 104.89 | × | 0.63 | x | 0.7 | = | 54.82 | (78) |
| South | 0.9x | 0.77 | x | 1.71 | x | 101.89 | x | 0.63 | x | 0.7 | = | 53.25 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 82.59 | × | 0.63 | x | 0.7 | = | 43.16 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 55.42 | × | 0.63 | x | 0.7 | = | 28.96 | (78) |
| South | 0.9x | 0.77 | × | 1.71 | × | 40.4 | × | 0.63 | x | 0.7 | = | 21.11 | (78) |

| Solar g | ains in | watts, ca | alculated | for eacl | n month | | | (83)m = S | um(74)m . | (82)m | | | | |
|----------|-----------|------------|-----------|----------------------|-------------|-----------|----------------------|-----------|-----------|--------|--------|--------|------|----------|
| (83)m= | 48.84 | 86.65 | 130.22 | 184.91 | 231.52 | 241.35 | 227.84 | 190.8 | 148.53 | 98.68 | 59.07 | 41.46 | | (83) |
| Total g | ains – ir | nternal a | ind solai | ⁻ (84)m = | = (73)m - | ⊦ (83)m | , watts | | | | | | _ | |
| (84)m= | 365.06 | 400.96 | 433.27 | 469.95 | 498.47 | 490.79 | 465.84 | 434.14 | 401.09 | 369.43 | 350.68 | 348.51 | | (84) |
| 7. Me | an inter | nal temp | erature | (heating | season |) | | | | | | | | |
| Temp | erature | during h | eating p | eriods ir | n the livir | ng area f | from Tab | ole 9, Th | 1 (°C) | | | | 21 | (85) |
| Utilisa | ation fac | tor for g | ains for | iving are | ea, h1,m | (see Ta | ble 9a) | | | | | | | |
| Stroma I | SAP 201 | 2 version: | 1.0.9.44 | SAP 9.52) | - http://ww | vw.stroma | .com ^l ul | Aug | Sep | Oct | Nov | Dec | Page | e 5 of 7 |

| | • |
|--|---------------|
| (86)m= 1 0.99 0.98 0.93 0.78 0.56 0.41 0.45 0.72 0.95 0.99 1 | (86) |
| Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) | |
| (87)m= 20.32 20.43 20.61 20.83 20.96 21 21 21 20.98 20.82 20.54 20.31 | (87) |
| Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) | |
| (88)m= 20.29 20.29 20.3 20.31 20.32 20.34 20.34 20.34 20.33 20.32 20.31 20.3 | (88) |
| Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) | |
| (89)m= 1 0.99 0.98 0.91 0.74 0.5 0.34 0.39 0.66 0.94 0.99 1 | (89) |
| Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) | 1 |
| (90)m= 19.38 19.54 19.79 20.12 20.28 20.33 20.34 20.34 20.32 20.11 19.72 19.38 | (90) |
| fLA = Living area ÷ (4) = | 0.43 (91) |
| Make interval to support the state of the state $(4, 4) \in \mathbb{T}_{2}$ | |
| Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.79 19.93 20.14 20.43 20.58 20.62 20.62 20.63 20.61 20.42 20.07 19.78 | (92) |
| Apply adjustment to the mean internal temperature from Table 4e, where appropriate |] |
| (93)m= 19.79 19.93 20.14 20.43 20.58 20.62 20.62 20.63 20.61 20.42 20.07 19.78 | (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-calc | culate |
| 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 0.92 0.75 0.53 0.37 0.42 0.69 0.94 0.99 1 | (94) |
| Useful gains, hmGm , $W = (94)m \times (84)m$ | 1 (05) |
| (95)m= 363.56 397.47 423.1 430.02 376.24 257.91 172.92 180.46 276.54 346.95 347.14 347.43 | (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 , $W = [(39)m \times [(93)m - (96)m]$ |] (00) |
| (97)m= 716.38 691.29 624.29 513 392.85 258.88 172.98 180.59 282.97 434.46 580.62 705.12 | (97) |
| Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ |] |
| (98)m= 262.49 197.45 149.69 59.74 12.36 0 0 0 0 0 65.11 168.1 266.12 |] |
| Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = | 1181.05 (98) |
| Space heating requirement in kWh/m²/year | 19.36 (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 | 93.7 (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) 262.49 197.45 149.69 59.74 12.36 0 0 0 65.11 168.1 266.12 | 1 |
| |] |
| $(211)m = \{[(98)m x (204)] \} x 100 \div (206)$ | (211) |
| 280.14 210.73 159.75 63.76 13.19 0 0 0 0 69.48 179.41 284.01 Total (kWh/year) =Sum(211) ₁₅₁₀₁₂ = | 1000.40 (211) |
| $10tal (xwiryear) = 00til(211)_{15,1012}$ | 1260.46 (211) |

Space heating fuel (secondary), kWh/month

| Space heating | • | | | month | | | | | | | | | |
|---|-------------------------------------|-----------|-----------|-----------|-----------|------------|-------------|---------------|------------------------|-------------------------|--------|-----------------------------|----------------------------------|
| = {[(98)m x (201 | | | | | | | | | | | | | |
| (215)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 ar) =Sum(2 | 0 | 0 | | |
| | | | | | | | TULA | ii (KVVII/yea | ar) =Sum(2 | 213) _{15,1012} | 7 | 0 | (215) |
| Water heating Output from wat | er heate | r (calci | ilated al | hove) | | | | | | | | | |
| | | 105.82 | 96.86 | 95.99 | 86.17 | 83.47 | 91.5 | 91.29 | 101.16 | 104.58 | 110.68 | | |
| Efficiency of wat | ter heate | er | | | | | | | | | | 87.2 | (216) |
| (217)m= 89.61 | 89.49 | 89.22 | 88.5 | 87.59 | 87.2 | 87.2 | 87.2 | 87.2 | 88.54 | 89.32 | 89.64 | | (217) |
| Fuel for water he (219)m = (64)m | - | | | | | | | | | | | | |
| | | 118.61 | 109.45 | 109.59 | 98.82 | 95.72 | 104.93 | 104.69 | 114.26 | 117.08 | 123.47 | | |
| | | | | | | | Tota | l = Sum(2 | 19a) ₁₁₂ = | | | 1334.96 | (219) |
| Annual totals | | | | 4 | | | | | k\ | Wh/year | • | kWh/year | 7 |
| Space heating fu | | , main | system | 1 | | | | | | | | 1260.46 | ļ |
| Water heating fu | uel used | | | | | | | | | | | 1334.96 | |
| Electricity for pu | imps, far | ns and | electric | keep-hot | | | | | | | | | |
| mechanical ver | ntilation | - balan | ced, ext | ract or p | ositive i | nput fror | n outside | Ð | | | 97.96 | | (230a) |
| central heating | pump: | | | | | | | | | | 30 | | (230 <mark>c</mark>) |
| boi <mark>ler wi</mark> th a far | n-assiste | d flue | | | | | | | | | 45 | | (230e) |
| Tota <mark>l elec</mark> tricity f | for th <mark>e a</mark> | bove, k | Wh/yea | r | | | sum | of (230a). | <mark>(2</mark> 30g) = | | | 172.96 | (231) |
| Elec <mark>tricity</mark> for lig | hting | | | | | | | | | | | 291.56 | (232) |
| Electricity gener | rated by | PVs | | | | | | | | | | -2 <mark>59.09</mark> | (233) |
| Total delivered e | energy fo | or all us | ses (211 |)(221) | + (231) | + (232). | (237b) | _ | | | | 2 <mark>800.8</mark> 5 | (338) |
| 12a. CO2 emis | sions – | Individu | ual heati | ing syste | ms inclu | uding mi | cro-CHF |) | | - | | | |
| | | | | | | ergy | | | | ion fac | tor | Emissions | |
| | | | | | | /h/year | | | kg CO | | | kg CO2/yea | _ |
| Space heating (| | | | | | 1) x | | | 0.2 | 16 | = | 272.26 | (261) |
| Space heating (| seconda | ıry) | | | (21 | 5) x | | | 0.5 | 19 | = | 0 | (263) |
| Water heating | | | | | (219 | 9) x | | | 0.2 | 16 | = | 288.35 | (264) |
| Space and wate | er heating | 9 | | | (261 | 1) + (262) | + (263) + (| 264) = | | | | 560.61 | (265) |
| Electricity for pu | ımps, far | is and | alactric | keen-hot | (23) | 1) x | | | | | | | (203) |
| Electricity for lig | | | electric | | | | | | 0.5 | 19 | = | 89.76 | (267) |
| | hting | | electric | | | 2) x | | | 0.5 | | = | 89.76 151.32 | |
| Energy saving/g | • | | | · | | 2) x | | | | 19 | | | (267) |
| Energy saving/g | generatio | | | · | | 2) x | | sum o | 0.5 | 19 | = | 151.32 | (267) (268) |
| Energy saving/g Item 1 | generatio ear | n techi | nologies | · | | 2) x | | | 0.5 | 19 | = | -134.47 | (267) (268) (269) |
| Energy saving/g Item 1 Total CO2, kg/ye | generatio ear E missio | n techi | nologies | · | | 2) x | | | 0.5 [.] | 19 | = | 151.32 -134.47 667.23 | (267) (268) (269) (272) |

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 15 July 2021

Property Details: Unit 7 - 2B 3P - Be Green

| Dwelling type: | Flat |
|--|--------------------------------|
| Located in: | England |
| Region: | South East England |
| Cross ventilation possible: | Yes |
| Number of storeys: | 1 |
| Front of dwelling faces: | East |
| Overshading: | Average or unknown |
| Overhangs: | None |
| Thermal mass parameter: | Indicative Value Medium |
| Night ventilation: | False |
| Blinds, curtains, shutters: | None |
| Ventilation rate during hot weather (ach): | 3 (Windows open half the time) |
| Overheating Details: | |

| Summer ventilation heat loss coefficient: | 163.05 | |
|---|--------|--|
| Transmission heat loss coefficient: | 27.7 | |
| Summer heat loss coefficient: | 190.8 | |
| | | |

| | Ratio: | Z_overhangs: | | | | | |
|--|------------|---------------|-----------|--------|-----------|--------|---------|
| South (South Window) North (North Window) | | 1 | | | | | |
| North (North Window 2) | | 1 | | | | | |
| Solar shading: | | | | | | | |
| | | | | | _ | | |
| Orientation: | Z blinds: | Solar access: | Overl | hangs: | Z summer: | | |
| South (South Window) | 1 | 0.9 | 1 | | 0.9 | | (P8) |
| North (North Window) | 1 | 0.9 | 1 | | 0.9 | | (P8) |
| North (North Window 2) | 1 | 0.9 | 1 | | 0.9 | | (P8) |
| Solar gains: | | | | | | | |
| Orientation | Area | a Flux | g_ | FF | Shading | Gains | |
| South (South Window) | 0.9 x 1.71 | 118.4 | 0.63 | 0.7 | 0.9 | 72.32 | |
| North (North Window) | 0.9 x 3.42 | 86.66 | 0.63 | 0.7 | 0.9 | 105.87 | |
| North (North Window 2) | 0.9 x 4.09 | 86.66 | 0.63 | 0.7 | 0.9 | 126.61 | |
| . , | | | | | Total | 304.8 | (P3/P4) |

Internal gains:

| June | July | August | |
|-----------------|--|--|---|
| 359.56 | 345.01 | 352.22 | |
| 686.23 | 649.8 | 609.44 | (P5) |
| 3.6 | 3.41 | 3.19 | (P6) |
| 15.4 | 17.4 | 17.5 | |
| 0.25 | 0.25 | 0.25 | |
| 19.25 | 21.06 | 20.94 | (P7) |
| Not significant | Slight | Slight | |
| | 359.56 686.23 3.6 15.4 0.25 19.25 | 359.56345.01686.23649.83.63.4115.417.40.250.2519.2521.06 | 359.56345.01352.22686.23649.8609.443.63.413.1915.417.417.50.250.250.2519.2521.0620.94 |

Assessment of likelihood of high internal temperature:

<u>Slight</u>

(P1)

(P2)

Regulations Compliance Report

| Approved Documer Printed on 15 July 2 | | , England assessed by S | Stroma FSAF | 2012 program, Ve | rsion: 1.0.5.41 | |
|--|---|---|------------------------------------|----------------------------------|-----------------|--------------|
| Project Information | | | | | | |
| Assessed By: | () | | | Building Type: | Flat | |
| Dwelling Details: | | | | | | |
| NEW DWELLING | DESIGN STAGE | | | Total Floor Area: 1 | 117.6m² | |
| Site Reference : | 106 Bexley Road | | | Plot Reference: | Unit 14 - 3B 6F | P - Be Green |
| Address : | 106 Bexley Road , | Erith , DA8 3SP | | | | |
| Client Details: | | | | | | |
| Name: | Kang | | | | | |
| Address : | Upna Ltd , 106 Be | kley Road , Erith , DA8 3 | SP | | | |
| - | s items included wi e report of regulati | thin the SAP calculatio ons compliance. | ns. | | | |
| 1a TER and DER | | | | | | |
| | ng system: Mains ga | S | | | | |
| Fuel factor: 1.00 (m | iains gas) kide Emission Rate (| | | 16.92 kg/m² | | |
| - | ioxide Emission Rate | · · · · · | | 11.09 kg/m ² | | ОК |
| 1b TFEE and DFE | | | | | | |
| | gy Efficiency (TFEE) | | | 53.1 kWh/m ² | | |
| Dweiling Fabric End | ergy Efficiency (DFE | E) | | 42.4 kWh/m ² | _ | OK |
| 2 Fabric U-values | S S S S S S S S S S S S S S S S S S S | | | | | |
| Element External w Party wall | | Average 0.16 (max. 0.30) 0.00 (max. 0.20) | | Highest 0.16 (max. 0.70) - | | ОК |
| Floor | | (no floor) | | | | |
| Roof | | 0.11 (max. 0.20) | | 0.11 (max. 0.35) | | OK OK |
| Openings 2a Thermal bridg | ina | 1.18 (max. 2.00) | | 1.20 (max. 3.30) | | UK |
| | | om linear thermal transm | ittances for | each junction | | |
| 3 Air permeabilit | | | | · | | |
| Air permeab Maximum | ility at 50 pascals | | | 4.00 (design val 10.0 | lue) | ОК |
| 4 Heating efficier | псу | | | | | |
| Main Heating | g system: | Database: (rev 479, pro Boiler systems with rad Brand name: Worceste Model: Greenstar Model qualifier: 32CDi (Combi) Efficiency 89.8 % SEDI Minimum 88.0 % | liators or une er Compact Er | derfloor heating - m | ains gas | ок |
| Secondary h | neating system: | None | | | | |

Regulations Compliance Report

| cylinder insulation | | | |
|-------------------------------|-------------------------|--------------------------|----|
| Hot water Storage: | No cylinder | | |
| Controls | | | |
| | | | |
| Space heating controls | TTZC by plumbing and el | ectrical services | OK |
| Hot water controls: | No cylinder thermostat | | |
| | No cylinder | | |
| Boiler interlock: | Yes | | OK |
| ow energy lights | | | |
| Percentage of fixed lights wi | th low-energy fittings | 100.0% | |
| Minimum | | 75.0% | OK |
| lechanical ventilation | | | |
| Continuous supply and extra | ct system | | |
| Specific fan power: | | 0.46 | |
| Maximum | | 1.5 | OK |
| MVHR efficiency: | | 92% | |
| Minimum | | 70% | OK |
| Summertime temperature | | | |
| Overheating risk (South Eas | t England): | Slight | OK |
| ed on: | | | |
| Overshading: | | Average or unknown | |
| Windows facing: West | | 1.28m ² | |
| Windows facing: North | | 3.84m ² | |
| Windows facing: North | | 4.09m ² | |
| Windows facing: East | | 6.14m ² | |
| Ventilation rate: | | 3.00 | |
| Blinds/curtains: | | None | |
| | | | |
| Key features | | | |
| Thermal bridging | | 0.028 W/m ² K | |
| Doors U-value | | 1 W/m²K | |
| Roofs U-value | | 0.11 W/m²K | |
| Party Walls U-value | | 0 W/m²K | |
| Photovoltaic array | | | |

Property Details: Unit 14 - 3B 6P - Be Green

| Address: | 106 Bexley Road , Erith , DA8 3SP |
|-----------------------------------|-----------------------------------|
| Located in: | England |
| Region: | South East England |
| UPRN: | |
| Date of assessment: | 13 July 2021 |
| Date of certificate: | 15 July 2021 |
| Assessment type: | New dwelling design stage |
| Transaction type: | New dwelling |
| Tenure type: | Unknown |
| Related party disclosure: | No related party |
| Thermal Mass Parameter: | Indicative Value Medium |
| Water use <= 125 litres/person/da | ay: True |
| PCDF Version: | 479 |

| Property description | n: | | | | | |
|-------------------------------------|----------------------|--|--------------|------------------------------------|------------|------------------|
| Dwelling type: | | Flat | | | | |
| Detachment: Year Completed: | | 2021 | | | | |
| • | | | | | | |
| Floor Location: | | Floor area: | | Storey height | • | |
| Floor 0 | | 117.6 m² | | 2.7 m | • | |
| | | | | 2.7 111 | | |
| Living area: Front of dwelling f | | 36.5 m ² (fraction 0.31) South | | | | |
| | aces. | 300111 | | _ | | _ |
| Opening types: | | | | | | |
| Name: | Source: | Туре: | Glazing: | | Argon: | Frame: |
| Front Door | Manufacturer | Solid | | | | Wood |
| West Window | SAP 2012 | Windows | | 0.05, soft coat | Yes | PVC-U |
| North Window North Window 2 | SAP 2012 SAP 2012 | Windows Windows | | 0.05, soft coat 0.05, soft coat | Yes Yes | PVC-U PVC-U |
| East Window 2 | SAP 2012 | Windows | | 0.05, soft coat | Yes | PVC-U |
| | 5/11 2012 | WINdows | 10W E, EN = | 0.00, 3011 0001 | 105 | |
| Name: | Gap: | Frame Facto | or: g-value: | U-value: | Area: | No. of Openings: |
| Front Door | mm | 0.7 | 0 | 1 | 1.91 | 1 |
| West Window | 16mm or more | 0.7 | 0.63 | 1.2 | 1.28 | 1 |
| North Window | 16mm or more | 0.7 | 0.63 | 1.2 | 1.28 | 3 |
| North Window 2 | 16mm or more | 0.7 | 0.63 | 1.2 | 4.09 | 1 |
| East Window | 16mm or more | 0.7 | 0.63 | 1.2 | 6.14 | 1 |
| Name: | Type-Name: | Location: | Orient: | | Width: | Height: |
| Front Door | . jpo Hamoi | External Wall | South | | 0.91 | 2.1 |
| West Window | | External Wall | West | | 0.9 | 1.425 |
| North Window | | External Wall | North | | 0.9 | 1.425 |
| North Window 2 | | External Wall | North | | 1.475 | 2.775 |
| East Window | | External Wall | East | | 2.3 | 2.67 |
| | | | | | | |
| Overshading: | | Average or unknown | | | | |
| Opaque Elements: | | | | | | |
| | | | | | | |
| 51 | Gross area: Oper | nings: Net area: | U-value: | Ru value: | Curtair | n wall: Kappa: |
| External Elements External Wall | 92.88 17.3 | 26 75.62 | 0.16 | 0 | False | N/A |
| | 72.00 17 | 20 70.02 | 0.10 | 0 | | 11/1 |

0

0

28.35

117.6

0.16

0.11

0.4

0

False

28.35

117.6

Corridor Wall

Internal Elements

Flat Roof

N/A

N/A

| Party ElementsParty Wall7.0Party Floor11 | 02 7.6 | | | | | N/A N/A |
|---|------------------------------|---|---|---|---|------------|
| Thermal bridges: | | | | | | |
| Thermal bridges: [Approv [Approv [Approv [Approv [Approv [Approv | ved] ved] ved] ved] | User-defined Length 8.27 3.6 25.1 34.4 9.2 2.6 | (individual PSI- Psi-value 0.3 0.04 0.05 0.07 0.02 0.06 | •values) E2 E3 E4 E7 E9 E18 | Y-Value = 0.0278 Other lintels (including other steel lintels) Sill Jamb Party floor between dwellings (in blocks of flats) Balcony between dwellings, wall insulation continuou Party wall between dwellings | JS |
| Ventilation: | | | | | | |
| Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of passive stack: Number of sides sheltere Pressure test: Main heating system: Main heating system: | s: d: | Number of we Ductwork: Ins Approved Ins 0 0 0 1 4 8 Boiler system Gas boilers ar Fuel: mains g Info Source: I | a heat recovery et rooms: Kitch sulation, rigid tallation Schem as Boiler Database v 479, product | en + 2 ne: True s or und | lerfloor heating | .7 |
| | | (Combi boiler Systems with Central heatir | er: 32CDi Comp) radiators ng pump : 2013 emperature: De k: Yes | 3 or late | r w temperature >45°C | |
| Main heating Control: | | | | | | |
| Main heating Control: | | Time and tem services Control code: | | control | by suitable arrangement of plumbing and electric | cal |
| Secondary heating system | : | | | | | |
| Secondary heating system | n: | None | | | | |
| Water heating: | | | | | | |
| Water heating: | | | 901 as | | 060035) | |

Brand name: Worcester Model: Greenstar Xtra Model qualifier: 2015 Waste Water Heat Recovery System: Total rooms with shower and/or bath: 2 Product index: 080106, Megaflo SHRU 60 System B Number of mixer showers in rooms with a bath: 0 Number of mixer showers in rooms without a bath: 2 Solar panel: False

Others:

| Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: | Standard Tariff Unknown No conservatory 100% Low rise urban / suburban English |
|--|---|
| Wind turbine: | No |
| Photovoltaics: | Photovoltaic 1 Installed Peak power: 0.3 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South |
| Assess Zero Carbon Home: | No |
| | |

| Assessor Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.41 Property Address: Unit 14 - 3B 6P - Be Green Address: Init 17.5 (1a) x I - I - I - I - I - I - I - I - I - I | |
|--|--|
| Address :106 Bexley Road , Erith , DA8 3SPI. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Ground floor117.6(1a) × 2.7(2a) = 317.52(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)117.6(1a) × 2.7(2a) = 317.52(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)117.6(1a) × 2.7(2a) = 317.52(3a)Welling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =317.52(5)Ventilation rate:(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =317.52(6)Number of chimneys0(4b)0(4b)Number of passive vents0(4b)Number of passive vents0(4b)Number of flueless gas fires0(4b)Number of storeys in the dwelling (ns)(a) (40)Additional infiltration((b) (4b)Number of storeys in the dwelling (ns)(a) (40)Additional infiltration((b) (4b)Number of storeys in the dwelling (ns)(a) (40)Additional infiltration((b) (2b)Number of storeys in the dwelling (ns)(a) (40)Additional infiltration | |
| Area(m ²)Av. Height(m)Volume(m ³)Ground floorArea(m ²)Av. Height(m)Volume(m ³)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)117.6(1a)Volume(m ³)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)117.6(1a)Volume(m ³)Output(3a)+(3b)+(3c)+(3d)+(3e)+(3n)=Volume(m ³)Output(3a)+(3b)+(3c)+(3d)+(3e)+(3n)=Volume(m ³)Output(3a)+(3b)+(3c)+(3d)+(3e)+(3n)=Volume(m ³)Output(3a)+(3b)+(3c)+(3d)+(3e)+(3n)=OutputNumber of chimneyso(a)(a)Number of poen flueso(a)(b)Number of poen flueso(a)O(a)(a)Number of passive vents(a)(a)Number of flueless gas fires(a)(a)(a)(a)(a)(a)(a)(a)(a)(a)(a) <th col<="" td=""></th> | |
| Area(m²) (17.6)Av. Height(m) (13)Volume(m³) (3a)Ground floor117.6(1a) x2.7(2a) = 317.52 (3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)117.6(4)Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 317.52 (5) 2. Ventilation rate:abbbb Number of chimneys 0 $+$ 0 $=$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 (6b)Number of intermittent fans 0 $x10 =$ 0 (7a)Number of flueless gas fires 0 $x40 =$ 0 (7a)Number of flueless gas fires 0 $x40 =$ 0 (7b)Number of storeys in the dwelling (ns) 0 $x40 =$ 0 (9)Additional infiltration(9)-1(x0.1 = 0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)If both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35for masonry construction 0 (12)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 | |
| Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =317.52 (5) 2. Ventilation rate:total m³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x 40$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x 40$ 0 (6a)Number of intermittent fans 0 $+$ 0 $=$ 0 $x 10$ 0 (7a)Number of passive vents 0 $x 10$ 0 $x 10$ 0 $(7a)$ Number of flueless gas fires 0 $x 40$ 0 $(7c)$ Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 $+$ 0 $=$ 0 (6) Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 $+$ 0 $=$ 0 (6) Number of storeys in the dwelling (ns) 0 (9) (9) (9) (9) (9) (9) (9) (10) (9) (10) Structural infiltration 0.25 for steel or timber frame or 0.35 for masonry construction (9) (10) (11) 0 (12) If both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 0.21 0 (12) 0 (12) If no draught lobby, enter 0.05 , else enter 0 0.21 0 (12) 0 (12) If no draught lobby, enter 0.05 , else enter 0 0.21 <th< td=""></th<> | |
| 2. Ventilation rate: main heating secondary heating other total m³ per hour Number of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $x40 =$ 0 (6a) Number of open flues 0 $+$ 0 $+$ 0 $=$ 0 $x40 =$ 0 (6b) Number of open flues 0 $+$ 0 $+$ 0 $=$ 0 $x10 =$ 0 (7a) Number of passive vents 0 $x10 =$ 0 (7c) Number of flueless gas fires 0 $x40 =$ 0 (7c) Number of storeys in the dwelling (ns) 0 $x40 =$ 0 (7c) Additional infiltration (9) 0 (10) 0 (9) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) <i>it</i> both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 | |
| main heatingsecondary heatingothertotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $x20 =$ 0 $(6b)$ Number of intermittent fans 0 $x 10 =$ 0 $(7a)$ Number of passive vents 0 $x 10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x40 =$ 0 $(7c)$ Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 0 $x40 =$ 0 $(7c)$ Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 0 $(5) =$ 0 (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9) Additional infiltration (9) (9) (9) (9) Additional infiltration (9) (11) (9) (11) if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 (11) (12) If no draught lobby, enter 0.05, else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (12) | |
| heatingheatingheatingNumber of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $x40 =$ 0 $(6a)$ Number of open flues 0 $+$ 0 $+$ 0 $=$ 0 $x20 =$ 0 $(6b)$ Number of intermittent fans 0 $x10 =$ 0 $(7a)$ Number of passive vents 0 $x10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x40 =$ 0 $(7c)$ Number of flueless gas fires 0 $x40 =$ 0 $(7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $+$ 0 (9) Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $+$ 0 (9) Additional infiltration 0 (9) (10) (9) (10) Structural infiltration 0 (9) (11) 0 (11) if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 (11) 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (12) 0 (13) | |
| Number of passive vents 0 $x 10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b) =$ 0 $\div (5) =$ 0 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) 0 (9) Number of storeys in the dwelling (ns) 0 (9) (9) Additional infiltration (9) (10) (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 0 (12) If no draught lobby, enter 0.05 , else enter 0 0 (12) 0 (13) | |
| Number of flueless gas fires 0 	 x 40 = 0 	 (7c) Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 	 ÷ (5) = 0 	 (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 0 (12) 170 | |
| Number of flueless gas fires $0 \times 40 = 0$ (7c)Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 \div (5) = 0 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns)Additional infiltrationStructural infiltration:0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00013 | |
| Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0 \div (5) = 0$ 0(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(9)Additional infiltration(9)-1]x0.1 = 0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(12)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13) | |
| Number of storeys in the dwelling (ns) 0 (9) Additional infiltration 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 0 (11) If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (13) | |
| If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (13) | |
| | |
| Percentage of windows and doors draught stripped 0 (14) | |
| | |
| Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15) | |
| Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16) | |
| Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4 (17) | |
| If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.2 (18) | |
| Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered 1 (19) | |
| Number of sides sheltered 1 (19) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.92 (20) | |
| Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.19$ (21) | |
| Infiltration rate modified for monthly wind speed | |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec | |
| Monthly average wind speed from Table 7 | |
| (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 | |
| Wind Factor (22a)m = (22)m ÷ 4 | |
| (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 rat | e (allowi | ng for sh | nelter an | d wind s | speed) = | : (21a) x | (22a)m | | | | | |
|----------|------------------------|--------------------------------|-----------------------------|-------------|-------------|------------|----------------|---------------|-----------------|---------------|-------------|----------------|----------|--------|
| | 0.24 | 0.23 | 0.23 | 0.2 | 0.2 | 0.18 | 0.18 | 0.17 | 0.19 | 0.2 | 0.21 | 0.22 | | |
| | | <i>ctive air</i> al ventila | change i | rate for t | he applic | cable ca | ise | | | | | Г | 0.5 | (23a) |
| | | | using Appe | endix N, (2 | 3b) = (23a |) × Fmv (e | equation (I | N5)) , othe | erwise (23b | o) = (23a) | | L | 0.5 | (23b) |
| | | | overy: effici | | , , | | | | | , , , | | Ĺ | 78.2 | (23c) |
| | | | - | | - | | | | | 2h)m + (| 23b) x [| L 1 – (23c) | | (200) |
| (24a)m= | 0.34 | 0.34 | 0.34 | 0.31 | 0.31 | 0.28 | 0.28 | 0.28 | 0.29 | 0.31 | 0.32 | 0.33 | . 100] | (24a) |
| Ľ | balance | d mech | anical ve | ntilation | without | heat red | L coverv (I | 1 MV) (24I | $1_{0}m = (2)$ | 1 2b)m + (| 1 23b) | | | |
| (24b)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24b) |
| c) If v | whole h | ouse ex | tract ven | tilation of | or positiv | e input v | ventilatio | n from | outside | <u> </u> | | II | | |
| , | | | < (23b), t | | | • | | | | .5 × (23b |)) | | | |
| (24c)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24c) |
| , | | | on or wh | | • | | | | | - | - | | | |
| r | . , | | en (24d) | · · · · · · | , | | r | r | r Ó | <u> </u> | | | | |
| (24d)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24d) |
| r | | | rate - er | <u> </u> | , <u>,</u> | , , | ŕ | , | r`´´ | | | , | | () |
| (25)m= | 0.34 | 0.34 | 0.34 | 0.31 | 0.31 | 0.28 | 0.28 | 0.28 | 0.29 | 0.31 | 0.32 | 0.33 | | (25) |
| 3. Hea | at l <mark>osse</mark> | s and he | eat loss p | oaramete | er: | | | | | | | | | |
| ELEM | ENT | Gros | | Openin | - | Net Ar | | U-val | | AXU | | k-value | | AXk |
| Deere | | area | (m²) | m | 2 | A ,r | | W/m2 | | (VV/ | K) | kJ/m²·k | ` | kJ/K |
| Doors | - | | | | | 1.91 | | | = | 1.91 | | | | (26) |
| | vs Type | | | | | 1.28 | | /[1/(1.2)+ | | 1.47 | | | | (27) |
| | vs Type | | | | | 1.28 | | /[1/(1.2)+ | | 1.47 | | | | (27) |
| | vs Type | | | | | 4.09 | x1 | /[1/(1.2)+ | - 0.04] = | 4.68 | | | | (27) |
| Window | vs Type | 4 | | | | 6.14 | x1 | /[1/(1.2)+ | 0.04] = | 7.03 | | | | (27) |
| Walls T | ype1 | 92.8 | 38 | 17.20 | 6 | 75.62 | <u>2</u> X | 0.16 | = | 12.1 | | | | (29) |
| Walls T | ype2 | 28.3 | 35 | 0 | | 28.35 | 5 X | 0.15 | = | 4.26 | | | | (29) |
| Roof | | 117 | .6 | 0 | | 117.6 | 6 X | 0.11 | = | 12.94 | | | | (30) |
| Total a | rea of e | lements | s, m² | | | 238.8 | 3 | | | | | | | (31) |
| Party w | all | | | | | 7.02 | x | 0 | = | 0 | | | | (32) |
| Party fl | oor | | | | | 117.6 | 6 | | | | [| | | (32a) |
| | | | lows, use e sides of in | | | | lated using | g formula : | 1/[(1/U-valu | ue)+0.04] a | as given in | paragraph | 3.2 | |
| Fabric | heat los | s, W/K | = S (A x | U) | | | | (26)(30 |) + (32) = | | | [| 48.78 | (33) |
| Heat ca | apacity | Cm = S | (A x k) | | | | | | ((28). | (30) + (3 | 2) + (32a). | (32e) = | 13812. | 5 (34) |
| Therma | al mass | parame | eter (TMF | P = Cm ÷ | - TFA) in | ı kJ/m²K | | | Indica | ative Value | : Medium | [| 250 | (35) |
| - | | | nere the de tailed calcu | | constructi | on are no | t known pi | recisely th | e indicative | e values of | TMP in Ta | able 1f | | |
| Therma | al bridge | es : S (L | . x Y) cal | culated u | using Ap | pendix I | K | | | | | [| 6.63 | (36) |
| | | | are not kn | own (36) = | = 0.05 x (3 | 1) | | | | | | - | | |
| rotal fa | abric hea | at loss | | | | | | | (33) + | - (36) = | | L | 55.41 | (37) |

| Ventila | ation hea | at loss ca | alculated | monthl | у | - | - | | (38)m | = 0.33 × (| (25)m x (5) | | | |
|-----------|--------------------|---------------------|-------------------|--------------------------|------------------|--------------------|-------------------|--------------------|-------------|----------------------|------------------------|---------|---------|------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (38)m= | 36.14 | 35.65 | 35.17 | 32.74 | 32.26 | 29.84 | 29.84 | 29.35 | 30.81 | 32.26 | 33.23 | 34.2 | | (38) |
| Heat ti | ransfer o | coefficier | nt, W/K | | | | | | (39)m | = (37) + (3 | 38)m | | | |
| (39)m= | 91.55 | 91.06 | 90.58 | 88.16 | 87.67 | 85.25 | 85.25 | 84.76 | 86.22 | 87.67 | 88.64 | 89.61 | | |
| | | | | | | | | | | - | Sum(39)1. | 12 /12= | 88.04 | (39) |
| | <u> </u> | meter (H | <u>,</u> | I | | | | | · , | = (39)m ÷ | | | | |
| (40)m= | 0.78 | 0.77 | 0.77 | 0.75 | 0.75 | 0.72 | 0.72 | 0.72 | 0.73 | 0.75 | 0.75 | 0.76 | 0.75 | |
| Numbe | er of day | s in moi | nth (Tab | le 1a) | | | | | / | <pre>Average =</pre> | s Sum(40)₁. | 12/12= | 0.75 | (40) |
| | 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 Wa | ater heat | tina ener | rav reau | irement: | | | | | | | | kWh/ye | ar: | |
| | | | | | | | | | | | | | | |
| | | ipancy, l | | [1 ovp | (0 0003 | | TA 12 0 |)2)] + 0.(| 012 v / | FEA 12 | | 85 | | (42) |
| | A £ 13.9 | | + 1.70 X | r [i - exh | (-0.0003 | 949 X (11 | A -13.9 | <i>)</i> 2)] + 0.0 | JU13 X (| IFA - 13. | .9) | | | |
| | | | | | | | | (25 x N) | | | | 1.97 | | (43) |
| | | | | usage by r day (all w | | - | - | to achieve | a water us | se target o | of | | | |
| | | | | | | | · | A | 0 | Ort | Neu | Dee | | |
| Hot wat | Jan er usage ii | Feb n litres per | Mar day for ea | Apr ach month | May Vd.m = fa | Jun ctor from T | Jul Table 1c x | Aug (43) | Sep | Oct | Nov | Dec | | |
| (44)m= | 112.17 | , 108.09 | 104.01 | 99.93 | 95.85 | 91.77 | 91.77 | 95.85 | 99.93 | 104.01 | 108.09 | 112.17 | | |
| (44)11- | 112.17 | 100.03 | 104.01 | 33.35 | 35.05 | 91.77 | 31.77 | 90.00 | | | m(44) ₁₁₂ = | | 1223.66 | (44) |
| Energy | content of | hot water | used - ca | lculated me | onthly $= 4$. | 190 x Vd,r | n x nm x E | 0Tm / 3600 | | | ables 1b, 1 | | 1220.00 | |
| (45)m= | 166.34 | 145.48 | 150.13 | 130.88 | 125.59 | 108.37 | 100.42 | 115.24 | 116.61 | 135.9 | 148.35 | 161.09 | | |
| | | | | | | | | | | Fotal = Su | m(45) ₁₁₂ = | = | 1604.41 | (45) |
| lf instan | taneous w | ater heatii | | t of use (no | o hot water | r storage), | enter 0 in | boxes (46 |) to (61) | | • | | | |
| | 24.95 | 21.82 | 22.52 | 19.63 | 18.84 | 16.26 | 15.06 | 17.29 | 17.49 | 20.39 | 22.25 | 24.16 | | (46) |
| | storage | | includir | | alar ar M | | storada | within sa | me ves | ما | | 0 | | (47) |
| - | | . , | | ank in dw | | | - | | | 501 | | 0 | | (47) |
| | • | - | | | - | | | ombi boil | ers) ente | er '0' in (| (47) | | | |
| | storage | | | , | | | | | , | , | | | | |
| a) If m | nanufact | urer's de | eclared l | oss facto | or is kno | wn (kWł | n/day): | | | | | 0 | | (48) |
| Tempe | erature f | actor fro | m Table | 2b | | | | | | | | 0 | | (49) |
| | • | | • | e, kWh/ye | | | | (48) x (49) |) = | | | 0 | | (50) |
| , | | | | cylinder l rom Tabl | | | | | | | | 0 | | (51) |
| | | leating s | | | | | iy) | | | | | 0 | | (51) |
| | • | from Ta | | | | | | | | | | 0 | | (52) |
| Tempe | erature f | actor fro | m Table | 2b | | | | | | | | 0 | | (53) |
| Energy | y lost fro | m water | storage | e, kWh/ye | ear | | | (47) x (51) | x (52) x (| 53) = | | 0 | | (54) |
| Enter | (50) or (| (54) in (5 | 55) | | | | | | | | | 0 | | (55) |
| Water | storage | loss cal | culated | for each | month | | | ((56)m = (| 55) × (41)ı | m | | | | |
| (56)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (56) |

| in cynnue | er contains | s dedicated | d solar sto | rage, (57)r | n = (56)m | x [(50) – (l | H11)] ÷ (50 | 0), else (57 | 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) |
| Primar | y circuit | loss (an | nual) frc | om Table | 3 | | | | | | | 0 | | (58) |
| | • | • | , | for each | | 59)m = (| 58) ÷ 36 | 5 × (41) | m | | | | | |
| (mod | dified by | factor fr | om Tabl | le H5 if tl | here is s | olar 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 | culated | for each | month (| 61)m = (| (60) ÷ 36 | 35 × (41) | m | | | | | | |
| (61)m= | 24.91 | 22.5 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | | (61) |
| Total h | eat requ | uired for | water he | eating ca | lculated | for each | n month | (62)m = | 0.85 × (| 45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= | 191.26 | 167.99 | 175.04 | 154.99 | 150.5 | 132.48 | 125.34 | 140.15 | 140.72 | 160.81 | 172.46 | 186.01 | | (62) |
| Solar DH | HW input o | calculated | using App | endix G or | Appendix | H (negativ | ve quantity | r) (enter '0' | if no sola | r contributi | on to wate | er heating) | | |
| (add a | dditiona | l lines if | FGHRS | and/or V | VWHRS | applies, | , see Ap | pendix G | 6) | | | | | |
| (63)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| FHRS | 17.76 | 15.37 | 15.19 | 11.87 | 10.12 | 8.53 | 8.11 | 9.17 | 9.23 | 12.58 | 15.41 | 17.4 | | (63) (G2) |
| WWHR | -43.72 | -38.47 | -39.26 | -32.3 | -29.99 | -24.73 | -20.93 | -25.34 | -26.08 | -32.25 | -37.36 | -42.26 | | (63) (G10) |
| Output | from w | ater hea | ter | | | | | | | | | | | |
| (64)m= | 128.48 | 112.98 | 119.3 | 109.58 | 109.1 | 97.97 | 95.02 | 104.35 | 104.16 | 114.69 | 118.43 | 125.05 | | _ |
| | | | | | | | | Outp | ut from wa | ater heater | (annual)₁ | 12 | 1339.12 | (64) |
| Hea <mark>t g</mark> | ains froi | m wat <mark>er</mark> | heating, | . <mark>kWh</mark> /mc | onth 0.25 | <mark>5 ´</mark> [0.85 | × (45)m | + (61)m |] + 0.8 x | : [(46)m | + (57)m | + (59)m |] | |
| (65)m= | <mark>6</mark> 1.54 | 54 | 56.15 | 49.55 | 47.99 | 42.06 | 39.62 | 44.54 | 44.8 | 51.42 | 55.35 | 5 <mark>9.79</mark> | | (65) |
| (00) | | U . | | .0.00 | | | | | | | | | | () |
| | | | | of (65)m | | | | | | | | | eating | () |
| inclu | ide (57)i | m in calc | culation of | LI | only if c | | | | | | | | eating | |
| inclu 5. Int | ide (57)i ernal ga | m in calc | culation o Table 5 | of (65)m | only if c | | | | | | | | eating | |
| inclu 5. Int | ide (57)i ernal ga | m in calc ains (see | culation o Table 5 | of (65)m | only if c | | | | | | | | eating | |
| inclu 5. Int | ide (57)i ernal ga olic gain | m in calc ains (see s (Table | culation of Table 5 | of (65)m and 5a) | only if c | ylinder is | s in the c | lwelling | or hot w | ater is fr | om com | munity h | eating | (66) |
| inclu 5. Int Metabo (66)m= | ide (57)i ernal ga olic gain Jan 171.21 | m in calc ains (see s (Table Feb 171.21 | culation of Table 5 5), Wat Mar 171.21 | of (65)m 5 and 5a) ts Apr | only if c): May 171.21 | ylinder is Jun 171.21 | s in the c Jul 171.21 | Aug 171.21 | or hot w Sep 171.21 | ater is fr Oct | om com Nov | munity h | eating | |
| inclu 5. Int Metabo (66)m= | ide (57)i ernal ga olic gain Jan 171.21 | m in calc ains (see s (Table Feb 171.21 | culation of Table 5 5), Wat Mar 171.21 | of (65)m 5 and 5a) ts Apr 171.21 | only if c): May 171.21 | ylinder is Jun 171.21 | s in the c Jul 171.21 | Aug 171.21 | or hot w Sep 171.21 | ater is fr Oct | om com Nov | munity h | eating | |
| inclu 5. Int Metabo (66)m= Lightin (67)m= | ide (57)i ernal ga blic gain Jan 171.21 g gains 68.49 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 | Table 5 5), Wat Mar 171.21 ted in Ap 49.47 | of (65)m 5 and 5a) ts Apr 171.21 opendix L | May 171.21 28 | Jun 171.21 ion L9 or 23.64 | s in the c Jul 171.21 r L9a), al 25.54 | Aug 171.21 Iso see 33.2 | or hot w Sep 171.21 Fable 5 44.56 | Ater is fr Oct 171.21 56.57 | om com Nov 171.21 | Dec 171.21 | eating | (66) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= | ide (57)i ernal ga blic gain Jan 171.21 g gains 68.49 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 | Table 5 5), Wat Mar 171.21 ted in Ap 49.47 | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 | May 171.21 28 | Jun 171.21 ion L9 or 23.64 | s in the c Jul 171.21 r L9a), al 25.54 | Aug 171.21 Iso see 33.2 | or hot w Sep 171.21 Fable 5 44.56 | Ater is fr Oct 171.21 56.57 | om com Nov 171.21 | Dec 171.21 | eating | (66) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= | ide (57)i emal ga olic gain Jan 171.21 g gains 68.49 nces ga 420.98 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calc 425.35 | ted in Ap 49.47 ulated in 414.34 | of (65)m and 5a) ts Apr 171.21 opendix L 37.45 | only if c : May 171.21 _, equati 28 dix L, equ 361.32 | ylinder is Jun 171.21 ion L9 or 23.64 uation L ² 333.52 | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 | Aug 171.21 Iso see 33.2 3a), also 310.57 | Sep 171.21 Table 5 44.56 See Tal 321.58 | Oct 171.21 56.57 ole 5 345.02 | om com Nov 171.21 66.03 | Dec 171.21 70.39 | eating | (66) (67) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= | ide (57)i emal ga olic gain Jan 171.21 g gains 68.49 nces ga 420.98 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calc 425.35 | ted in Ap 49.47 ulated in 414.34 | of (65)m 5 and 5a) ts Apr 171.21 5 pendix L 37.45 6 Append 390.9 | only if c : May 171.21 _, equati 28 dix L, equ 361.32 | ylinder is Jun 171.21 ion L9 or 23.64 uation L ² 333.52 | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 | Aug 171.21 Iso see 33.2 3a), also 310.57 | Sep 171.21 Table 5 44.56 See Tal 321.58 | Oct 171.21 56.57 ole 5 345.02 | om com Nov 171.21 66.03 | Dec 171.21 70.39 | eating | (66) (67) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= | de (57)i emal ga Jan 171.21 g gains 68.49 nces ga 420.98 ng gains 54.97 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calc 425.35 (calcula | culation of Table 5 5), Wat Mar 171.21 ted in Ap 49.47 ulated in 414.34 ted in Ap 54.97 | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 Append 390.9 ppendix 54.97 | May 171.21 L, equati 28 dix L, equ 361.32 L, equat | ylinder is Jun 171.21 ion L9 or 23.64 uation L 333.52 ion L15 | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 or L15a) | Aug 171.21 Iso see 33.2 3a), also 310.57 , also se | Sep 171.21 Fable 5 44.56 see Tal 321.58 ee Table | ate r is fr Oct 171.21 56.57 ole 5 345.02 5 | om com Nov 171.21 66.03 374.6 | Dec 171.21 70.39 402.4 | eating | (66) (67) (68) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= | de (57)i emal ga Jan 171.21 g gains 68.49 nces ga 420.98 ng gains 54.97 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calc 425.35 (calcula 54.97 | culation of Table 5 5), Wat Mar 171.21 ted in Ap 49.47 ulated in 414.34 ted in Ap 54.97 | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 Append 390.9 ppendix 54.97 | May 171.21 L, equati 28 dix L, equ 361.32 L, equat | ylinder is Jun 171.21 ion L9 or 23.64 uation L 333.52 ion L15 | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 or L15a) | Aug 171.21 Iso see 33.2 3a), also 310.57 , also se | Sep 171.21 Fable 5 44.56 see Tal 321.58 ee Table | ate r is fr Oct 171.21 56.57 ole 5 345.02 5 | om com Nov 171.21 66.03 374.6 | Dec 171.21 70.39 402.4 | leating | (66) (67) (68) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= | ide (57)i ernal ga olic gain Jan 171.21 g gains 68.49 nces ga 420.98 ng gains 54.97 s and far 3 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calc 425.35 (calcula 54.97 ns gains 3 | Culation of the second | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 Appendix 390.9 ppendix 54.97 5a) | only if c May 171.21 L, equati 28 dix L, equati 361.32 L, equati 54.97 3 | ylinder is Jun 171.21 ion L9 or 23.64 uation L7 333.52 ion L15 54.97 | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 or L15a) 54.97 | Aug 171.21 Iso see - 33.2 3a), also 310.57 , also se 54.97 | Sep 171.21 Table 5 44.56 see Tal 321.58 ee Table 54.97 | ate r is fr Oct 171.21 56.57 56.57 54.97 | om com Nov 171.21 66.03 374.6 54.97 | Dec 171.21 70.39 402.4 54.97 | leating | (66) (67) (68) (69) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= | ide (57)i emal ga blic gain Jan 171.21 g gains 68.49 nces ga 420.98 ng gains 54.97 s and far 3 s e.g. ev | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calc 425.35 (calcula 54.97 ns gains 3 | culation of Table 5 5), Wat Mar 171.21 ted in Ap 49.47 ulated in Ap 414.34 ted in Ap 54.97 (Table 5 3 n (negat | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 Appendix 390.9 ppendix 54.97 5a) 3 tive value | only if c May 171.21 L, equati 28 dix L, equati 361.32 L, equati 54.97 3 | ylinder is Jun 171.21 ion L9 or 23.64 uation L7 333.52 ion L15 54.97 3 ule 5) | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 or L15a) 54.97 | Aug 171.21 Iso see - 33.2 3a), also 310.57 , also se 54.97 | Sep 171.21 Table 5 44.56 see Tal 321.58 ee Table 54.97 | ate r is fr Oct 171.21 56.57 56.57 54.97 | om com Nov 171.21 66.03 374.6 54.97 | Dec 171.21 70.39 402.4 54.97 | leating | (66) (67) (68) (69) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= | ide (57)i ernal ga olic gain Jan 171.21 g gains 68.49 nces ga 420.98 ng gains 54.97 and far 3 s e.g. ev -114.14 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calculat 425.35 (calcula 54.97 ns gains 3 raporatio | Culation of Table 5 Table 5 (5), Wat Mar 171.21 ted in Ap 49.47 ulated in Ap 414.34 ted in Ap 54.97 (Table 5 3 on (negat -114.14 | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 Appendix 390.9 ppendix 54.97 5a) 3 tive value | only if c : May 171.21 L, equati 28 dix L, equ 361.32 L, equat 54.97 3 es) (Tab | ylinder is Jun 171.21 ion L9 or 23.64 uation L7 333.52 ion L15 54.97 3 ule 5) | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 or L15a) 54.97 3 | Aug 171.21 Iso see 33.2 3a), also 310.57 , also se 54.97 | Sep 171.21 Table 5 44.56 See Tal 321.58 See Table 54.97 | ate r is fr Oct 171.21 56.57 ole 5 345.02 5 54.97 3 | om com Nov 171.21 66.03 374.6 54.97 3 | Dec 171.21 70.39 402.4 54.97 3 | leating | (66) (67) (68) (69) (70) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= | ide (57)i ernal ga olic gain Jan 171.21 g gains 68.49 nces ga 420.98 ng gains 54.97 and far 3 s e.g. ev -114.14 | m in calc ains (see Feb 171.21 (calculat 60.83 ins (calculat 425.35 (calcula 54.97 ns gains 3 aporatio -114.14 | Culation of Table 5 Table 5 (5), Wat Mar 171.21 ted in Ap 49.47 ulated in Ap 414.34 ted in Ap 54.97 (Table 5 3 on (negat -114.14 | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 Appendix 390.9 ppendix 54.97 5a) 3 tive value | only if c : May 171.21 L, equati 28 dix L, equ 361.32 L, equat 54.97 3 es) (Tab | ylinder is Jun 171.21 ion L9 or 23.64 uation L7 333.52 ion L15 54.97 3 ule 5) | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 or L15a) 54.97 3 | Aug 171.21 Iso see 33.2 3a), also 310.57 , also se 54.97 | Sep 171.21 Table 5 44.56 See Tal 321.58 See Table 54.97 | ate r is fr Oct 171.21 56.57 ole 5 345.02 5 54.97 3 | om com Nov 171.21 66.03 374.6 54.97 3 | Dec 171.21 70.39 402.4 54.97 3 | eating | (66) (67) (68) (69) (70) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m= | ide (57)i emal ga blic gain Jan 171.21 g gains 68.49 nces gai 420.98 ng gains 54.97 s and far 3 s e.g. ev -114.14 heating 82.71 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calculat 425.35 (calculat 54.97 ns gains 3 aporatio -114.14 gains (T | Culation of Table 5 Table 5 (5), Wat Mar 171.21 ted in Ap 49.47 ulated in Ap 414.34 ted in Ap 54.97 (Table 5 3 on (negat -114.14 Table 5) 75.46 | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 Appendix 390.9 ppendix 54.97 5a) 3 tive value -114.14 | only if c : May 171.21 L, equati 28 dix L, equ 361.32 L, equat 54.97 3 es) (Tab -114.14 | ylinder is Jun 171.21 ion L9 or 23.64 uation L2 333.52 ion L15 of 54.97 3 le 5) -114.14 58.42 | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 or L15a) 54.97 3 -114.14 | Aug 171.21 Iso see 33.2 3a), also 310.57 , also se 54.97 3 -114.14 59.87 | or hot w Sep 171.21 Table 5 44.56 see Tal 321.58 ee Table 54.97 3 -114.14 | ate r is fr Oct 171.21 56.57 56.57 54.97 54.97 3 3 -114.14 69.11 | om com Nov 171.21 66.03 374.6 54.97 3 -114.14 76.88 | Munity h | leating | (66) (67) (68) (69) (70) (71) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m= | ide (57)i emal ga blic gain Jan 171.21 g gains 68.49 nces gai 420.98 ng gains 54.97 s and far 3 s e.g. ev -114.14 heating 82.71 | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calculat 425.35 (calcula 54.97 ns gains 3 raporatio -114.14 gains (T 80.36 | Culation of Table 5 Table 5 (5), Wat Mar 171.21 ted in Ap 49.47 ulated in Ap 414.34 ted in Ap 54.97 (Table 5 3 on (negat -114.14 Table 5) 75.46 | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 Appendix 390.9 ppendix 54.97 5a) 3 tive value -114.14 | only if c : May 171.21 L, equati 28 dix L, equ 361.32 L, equat 54.97 3 es) (Tab -114.14 | ylinder is Jun 171.21 ion L9 or 23.64 uation L2 333.52 ion L15 of 54.97 3 le 5) -114.14 58.42 | Jul 171.21 (L9a), al 25.54 13 or L13 314.94 or L15a) 54.97 3 -114.14 | Aug 171.21 Iso see 33.2 3a), also 310.57 , also se 54.97 3 -114.14 59.87 | or hot w Sep 171.21 Table 5 44.56 see Tal 321.58 ee Table 54.97 3 -114.14 | ate r is fr Oct 171.21 56.57 56.57 54.97 54.97 3 3 -114.14 69.11 | om com Nov 171.21 66.03 374.6 54.97 3 -114.14 76.88 | Munity h | leating | (66) (67) (68) (69) (70) (71) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (70)m= Losses (71)m= Water (72)m= Total i (73)m= | ide (57)i ernal ga olic gain Jan 171.21 g gains 68.49 nces ga 420.98 ng gains 54.97 s and far 3 s e.g. ev -114.14 heating 82.71 nternal | m in calc ains (see s (Table Feb 171.21 (calculat 60.83 ins (calculat 425.35 (calculat 54.97 ns gains 3 aporatio -114.14 gains (T 80.36 gains = 681.58 | Culation of the second | of (65)m 5 and 5a) ts Apr 171.21 5pendix L 37.45 6 Appendix 390.9 ppendix 54.97 5a) 3 tive value -114.14 | only if c May 171.21 _, equati 28 dix L, equ 361.32 L, equat 54.97 3 es) (Tab -114.14 64.5 | ylinder is Jun 171.21 ion L9 or 23.64 uation L7 333.52 ion L15 54.97 3 le 5) -114.14 58.42 (66) | Jul 171.21 r L9a), al 25.54 13 or L13 314.94 or L15a) 54.97 3 -114.14 53.25 m + (67)m | Aug 171.21 Iso see - 33.2 3a), also 310.57 , also se 54.97 3 -114.14 59.87 + (68)m + | or hot w Sep 171.21 Table 5 44.56 see Table 54.97 3 -114.14 62.22 (69)m + (| ate r is fr Oct 171.21 56.57 56.57 54.97 54.97 3 -114.14 69.11 70)m + (7 | om com Nov 171.21 66.03 374.6 54.97 3 -114.14 76.88 1)m + (72) | Munity h | leating | (66) (67) (68) (69) (70) (71) (72) |

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

| Orientation: | | | Area m² | Flux Table 6a | | | g_ Table 6b | | FF Table 6c | Gains (W) | | |
|--------------|--------|---|------------|------------------|--------|---|----------------|---|----------------|--------------|--------|------|
| North 0.9 | x 0.77 | x | 1.28 | x | 10.63 | x | 0.63 | x | 0.7 | = | 12.48 | (74) |
| North 0.9 | x 0.77 | x | 4.09 | x | 10.63 | x | 0.63 | x | 0.7 | = | 13.29 | (74) |
| North 0.9 | x 0.77 | x | 1.28 | x | 20.32 | x | 0.63 | x | 0.7 | = | 23.85 | (74) |
| North 0.9 | x 0.77 | × | 4.09 | x | 20.32 | x | 0.63 | x | 0.7 | = | 25.4 | (74) |
| North 0.9 | x 0.77 | × | 1.28 | x | 34.53 | x | 0.63 | x | 0.7 | = | 40.52 | (74) |
| North 0.9 | × 0.77 | × | 4.09 | x | 34.53 | x | 0.63 | x | 0.7 | = | 43.16 | (74) |
| North 0.9 | x 0.77 | × | 1.28 | x | 55.46 | x | 0.63 | x | 0.7 | = | 65.09 | (74) |
| North 0.9 | x 0.77 | × | 4.09 | x | 55.46 | x | 0.63 | x | 0.7 | = | 69.33 | (74) |
| North 0.9 | x 0.77 | × | 1.28 | x | 74.72 | x | 0.63 | x | 0.7 | = | 87.68 | (74) |
| North 0.9 | x 0.77 | × | 4.09 | x | 74.72 | x | 0.63 | x | 0.7 | = | 93.39 | (74) |
| North 0.9 | x 0.77 | × | 1.28 | x | 79.99 | x | 0.63 | x | 0.7 | = | 93.87 | (74) |
| North 0.9 | x 0.77 | × | 4.09 | × | 79.99 | x | 0.63 | x | 0.7 | = | 99.98 | (74) |
| North 0.9 | x 0.77 | × | 1.28 | x | 74.68 | x | 0.63 | x | 0.7 | = | 87.64 | (74) |
| North 0.9 | x 0.77 | × | 4.09 | x | 74.68 | x | 0.63 | x | 0.7 | = | 93.34 | (74) |
| North 0.9 | x 0.77 | x | 1.28 | x | 59.25 | x | 0.63 | x | 0.7 | = | 69.53 | (74) |
| North 0.9 | x 0.77 | x | 4.09 | × | 59.25 | х | 0.63 | х | 0.7 | = | 74.06 | (74) |
| North 0.9 | x 0.77 | x | 1.28 | х | 41.52 | x | 0.63 | x | 0.7 | = | 48.72 | (74) |
| North 0.9 | × 0.77 | x | 4.09 | х | 41.52 | × | 0.63 | x | 0.7 | = | 51.89 | (74) |
| North 0.9 | × 0.77 | x | 1.28 | X | 24.19 | x | 0.63 | × | 0.7 | = | 28.39 | (74) |
| North 0.9 | × 0.77 | x | 4.09 | × | 24.19 | х | 0.63 | × | 0.7 | = | 30.24 | (74) |
| North 0.9 | × 0.77 | x | 1.28 | × | 13.12 | x | 0.63 | × | 0.7 | = | 15.39 | (74) |
| North 0.9 | x 0.77 | × | 4.09 | × | 13.12 | x | 0.63 | x | 0.7 | = | 16.4 | (74) |
| North 0.9 | x 0.77 | × | 1.28 | x | 8.86 | x | 0.63 | x | 0.7 | = | 10.4 | (74) |
| North 0.9 | x 0.77 | × | 4.09 | x | 8.86 | х | 0.63 | x | 0.7 | = | 11.08 | (74) |
| East 0.9 | x 0.77 | × | 6.14 | x | 19.64 | x | 0.63 | x | 0.7 | = | 36.85 | (76) |
| East 0.9 | x 0.77 | × | 6.14 | x | 38.42 | x | 0.63 | x | 0.7 | = | 72.09 | (76) |
| East 0.9 | x 0.77 | × | 6.14 | × | 63.27 | x | 0.63 | x | 0.7 | = | 118.73 | (76) |
| East 0.9 | × 0.77 | × | 6.14 | × | 92.28 | x | 0.63 | x | 0.7 | = | 173.16 | (76) |
| East 0.9 | × 0.77 | × | 6.14 | × | 113.09 | x | 0.63 | x | 0.7 | = | 212.21 | (76) |
| East 0.9 | × 0.77 | × | 6.14 | x | 115.77 | x | 0.63 | x | 0.7 | = | 217.24 | (76) |
| East 0.9 | - | × | 6.14 | x | 110.22 | x | 0.63 | X | 0.7 | = | 206.82 | (76) |
| East 0.9 | | × | 6.14 | X | 94.68 | X | 0.63 | x | 0.7 | = | 177.66 | (76) |
| East 0.9 | | × | 6.14 | x | 73.59 | x | 0.63 | x | 0.7 | = | 138.09 | (76) |
| East 0.9 | | × | 6.14 | x | 45.59 | x | 0.63 | x | 0.7 | = | 85.55 | (76) |
| East 0.9 | | x | 6.14 | × | 24.49 | x | 0.63 | x | 0.7 | = | 45.95 | (76) |
| East 0.9 | - | × | 6.14 | × | 16.15 | x | 0.63 | x | 0.7 | = | 30.31 | (76) |
| West 0.9 | | × | 1.28 | × | 19.64 | x | 0.63 | X | 0.7 | = | 7.68 | (80) |
| West 0.9 | | × | 1.28 | × | 38.42 | x | 0.63 | x | 0.7 | = | 15.03 | (80) |
| West 0.9 | x 0.77 | × | 1.28 | x | 63.27 | x | 0.63 | x | 0.7 | = | 24.75 | (80) |

| | - | | | | | - | | | | | | | | | | |
|---------|------------------|-------------------|----------------------------------|---------------------|---------------|----------|----------------|-----------|----------|----------|----------|-----------|-------------|-----------|-------|---------|
| West | 0.9x | 0.77 | X | 1.2 | 28 | × | 9 | 2.28 | × | 0.6 | 3 | _ × _ | 0.7 | = | 36.1 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | × | 1′ | 13.09 | x | 0.6 | 3 | × | 0.7 | = | 44.24 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 11 | 15.77 | x | 0.6 | 3 | × | 0.7 | = | 45.29 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 1′ | 10.22 | × | 0.6 | 3 | x | 0.7 | = | 43.12 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 9 | 4.68 | x | 0.6 | 3 | x | 0.7 | = | 37.04 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 7 | 3.59 |] × [| 0.6 | 3 | _ x [| 0.7 | = | 28.79 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 4 | 5.59 |] × [| 0.6 | 3 | _ x [| 0.7 | = | 17.83 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x [| 2 | 4.49 |) × [| 0.6 | 3 | x | 0.7 | = | 9.58 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 1 | 6.15 |) × [| 0.6 | 3 | x | 0.7 | = | 6.32 | (80) |
| | _ | | | | | _ | | | | | | | | | | |
| Solar g | ains in | watts, ca | alculated | for eac | h month | _ | | | (83)m | = Sum(7 | 4)m | .(82)m | | | | |
| (83)m= | 70.31 | 136.37 | 227.17 | 343.68 | 437.53 | 45 | 6.37 | 430.92 | 358. | 28 267 | .49 | 162 | 87.32 | 58.11 | | (83) |
| Total g | ains – i | nternal a | nd sola | r (84)m = | = (73)m | + (8 | 33)m | , watts | - | | | | _ | | | |
| (84)m= | 757.53 | 817.95 | 881.48 | 955.89 | 1006.39 | 98 | 6.99 | 939.69 | 876. | 96 810 | 0.9 | 747.75 | 719.88 | 726.31 | | (84) |
| 7. Mea | an inter | nal temp | oerature | (heating | season |) | | | | | | | | | | |
| Temp | erature | during h | eating p | eriods ir | n the livi | ng a | area f | from Tab | ole 9, | Th1 (°0 | C) | | | | 21 | (85) |
| Utilisa | tion fac | tor for g | ains for | living are | ea, h1,m | i (se | е Та | ble 9a) | | | | | | | |] |
| _ | Jan | Feb | Mar | Apr | May | Ì, | Jun | Jul | Αι | ıg S | ер | Oct | Nov | Dec | | |
| (86)m= | 1 | 0.99 | 0.98 | 0.92 | 0.77 | 0 | .55 | 0.4 | 0.4 | 4 0.7 | 71 | 0.95 | 0.99 | 1 | | (86) |
| Mean | interna | l temper | ature in | living ar | ea T1 (fo | | N Ste | ns 3 to 7 | in T | able 9c | L | | | | | |
| (87)m= | 20.34 | 20.44 | 20.61 | 20.84 | 20.96 | 1 | 21 | 21 | 21 | | - | 20.82 | 20.55 | 20.33 | | (87) |
| L | | | | | | | | | | | | | | | | |
| - i r | erature 20.27 | during h 20.28 | 20.28 | 20.3 | 20.3 | r | eiiing 0.32 | 20.32 | 20.3 | <u> </u> | <u> </u> | 20.3 | 20.29 | 20.29 | | (88) |
| (88)m= | | | | | | | | | | | 51 | 20.5 | 20.29 | 20.29 | | (00) |
| г | | tor for g | i | i | <u> </u> | - | | | ŕ | | | | | | | () |
| (89)m= | 0.99 | 0.99 | 0.97 | 0.9 | 0.72 | 0 | .49 | 0.34 | 0.3 | 8 0.6 | 65 | 0.93 | 0.99 | 1 | | (89) |
| Mean | interna | l temper | ature in | the rest | of dwell | ing | T2 (fo | ollow ste | eps 3 | to 7 in | Table | e 9c) | | | | |
| (90)m= | 19.38 | 19.53 | 19.79 | 20.11 | 20.27 | 20 | 0.32 | 20.32 | 20.3 | 32 20 | .3 | 20.1 | 19.72 | 19.38 | | (90) |
| | | | | | | | | | | | fL | A = Livir | ng area ÷ (| 4) = | 0.31 | (91) |
| Mean | interna | l temper | ature (fo | or the wh | ole dwe | lling | g) = fL | _A × T1 | + (1 - | – fLA) × | : T2 | | | | | |
| (92)m= | 19.68 | 19.82 | 20.04 | 20.34 | 20.48 | <u> </u> | 0.53 | 20.53 | 20.5 | | - T | 20.33 | 19.98 | 19.68 | | (92) |
| Apply | adjustr | nent to t | he mear | interna | l temper | atur | re fro | m Table | 4e, \ | where a | ppro | priate | • | | | |
| (93)m= | 19.68 | 19.82 | 20.04 | 20.34 | 20.48 | 20 | 0.53 | 20.53 | 20.5 | 53 20. | 51 | 20.33 | 19.98 | 19.68 | | (93) |
| 8. Spa | ace hea | ting requ | uirement | i i | | | | | | | | | | | | |
| | | | | • | | ned | at ste | ep 11 of | Table | e 9b, so | that | Ti,m=(| (76)m an | d re-calc | ulate | |
| the uti | | factor fo | | <u> </u> | r | - | | | | | | | 1 | 1 | I | |
| | Jan | Feb | Mar | Apr | May | <u> </u> | Jun | Jul | Αι | ıg S | ер | Oct | Nov | Dec | | |
| Г | | tor for g | | | 0.74 | | 54 | 0.00 | | | | 0.00 | | | l | (04) |
| (94)m= | 0.99 | 0.99 | 0.97 | 0.9 | 0.74 | 0 | .51 | 0.36 | 0.4 | 0.6 | 57 | 0.93 | 0.99 | 1 | | (94) |
| (95)m= | 752.78 | hmGm . 808.33 | , VV = (9 [,] 855.18 | 4)m x (84 860.13 | 4)m 740.58 | 50 | 3.62 | 334.94 | 350. | 06 541 | 74 | 693.64 | 709.75 | 722.74 | | (95) |
| , í L | | age exte | | | | | | 554.54 | 550. | 00 341 | ./4 | 035.04 | 709.75 | 122.14 | | (00) |
| (96)m= | 4.3 | 4.9 | 6.5 | 8.9 | 11.7 | 1 | 4.6 | 16.6 | 16. | 4 14 | .1 | 10.6 | 7.1 | 4.2 | | (96) |
| L | | e for mea | | | | | | | | | | | I | | | x · - / |
| r | | 1358.24 | r | · · · | 770.12 | | , vv – | 335.04 | 350. | <u> </u> | <u> </u> | 852.71 | 1141.32 | 1386.84 | | (97) |
| () ' | | | | | | Ľ | | | L | | | | | | l | · · · |

| Space | e heatin | g requir | ement fo | or each n | nonth, k | Wh/mon | th = 0.02 | 24 x [(97 |)m – (95 |)m] x (4 ⁻ | 1)m | | | |
|----------|-----------------|-----------|----------------------|-----------------------|----------------|-----------|-----------|---|-----------------|-----------------------|-------------------------|------------|----------|------------|
| (98)m= | 487.45 | 369.54 | 276.52 | 106.73 | 21.98 | 0 | 0 | 0 | 0 | 118.35 | 310.73 | 494.09 | | _ |
| | | | | | | | | Tota | l per year | (kWh/year | [.]) = Sum(9 | 8)15,912 = | 2185.4 | (98) |
| Space | e heatin | g requir | ement in | 1 kWh/m² | ²/year | | | | | | | | 18.58 | (99) |
| 9a. En | ergy rec | luiremer | nts – Ind | ividual h | eating s | ystems i | ncluding | g micro-C | CHP) | | | | | |
| | e heatir | - | | | , . | | | | | | | i | | |
| | | | | econdar | | ementary | system | (202) = 1 · | (201) - | | | | 0 | (201) |
| | | | | nain syst main sys | . , | | | $(202) = 1^{-1}$ $(204) = (2^{-1})^{-1}$ | | (203)] - | | · | 1 | (202) |
| | | | 0 | ing syste | | | | (204) = (2 | 02) ~ [1 | (200)] – | | | 1 | (204) |
| | • | | | ementar | | a evetor | 0/_ | | | | | | 93.7 | (208) |
| EIIICIE | • | | 1 | i | - I | 1 | i | | 0 | 0.1 | NL | Du | 0 | |
| Snace | Jan A heatin | Feb | Mar | Apr alculate | May d above | Jun | Jul | Aug | Sep | Oct | Nov | Dec | kWh/yea | ar |
| Opact | 487.45 | 369.54 | 276.52 | 106.73 | 21.98 | 0 | 0 | 0 | 0 | 118.35 | 310.73 | 494.09 | | |
| (211)m | n = {[(98 |)m x (20 | 1)4)] } x 1 | 1 100 ÷ (20 | | ļ | 1 | ! | | | 1 | 1 | | (211) |
| | 520.22 | 394.39 | 295.11 | 113.91 | 23.46 | 0 | 0 | 0 | 0 | 126.3 | 331.62 | 527.31 | | . , |
| | | | | | | | | Tota | l (kWh/yea | ar) =Sum(2 | 211) _{15,1012} | = | 2332.33 | (211) |
| - | | - | | y), kWh/ | month | | | | | | | | | |
| | | | 00 ÷ (20 | | | | | | | | | | | |
| (215)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 Tota | 0 I (kWh/yea | 0 ar) = Sum(2) | 0 | 0 | 0 | (215) |
| Water | heating | | | | | | | 1010 | | (1) -Oum(1 | 1 | _ | | (210) |
| | | | ter (calc | ulated al | bove) | | | | | | | | | |
| | 128.48 | 112.98 | 119.3 | 109.58 | 109.1 | 97.97 | 95.02 | 104.35 | 104.16 | 11 <mark>4.6</mark> 9 | 118.43 | 125.05 | | _ |
| Efficier | ncy of w | ater hea | ater | i | - | | | | | | | | 87.2 | (216) |
| (217)m= | | 89.86 | 89.62 | 88.89 | 87.77 | 87.2 | 87.2 | 87.2 | 87.2 | 88.94 | 89.71 | 89.97 | | (217) |
| | | | , kWh/m) ÷ (217) | | | | | | | | | | | |
| | 142.84 | 125.73 | 133.12 | 123.27 | 124.31 | 112.35 | 108.96 | 119.67 | 119.45 | 128.95 | 132.02 | 138.99 | | |
| I | | | | | | | | Tota | l = Sum(2 | 19a) ₁₁₂ = | | | 1509.68 | (219) |
| | I totals | | | | | | | | | k | Wh/year | | kWh/year | - |
| Space | heating | fuel use | ed, main | system | 1 | | | | | | | | 2332.33 | |
| Water | heating | fuel use | ed | | | | | | | | | | 1509.68 | |
| Electric | city for p | oumps, f | ans and | electric | keep-ho | ot | | | | | | | | |
| mech | anical v | entilatio | n - balar | nced, ext | ract or p | ositive i | nput fror | m outside | Э | | | 222.74 | | (230a) |
| centra | al heatir | g pump | : | | | | | | | | | 30 | | (230c) |
| boiler | with a f | an-assis | sted flue | | | | | | | | | 45 | | (230e) |
| Total e | lectricity | / for the | above, | kWh/yea | r | | | sum | of (230a). | (230g) = | | | 297.74 | (231) |
| | city for li | | | - | | | | | | | | | 483.8 |](232) |
| | | erated b | v P\/s | | | | | | | | | | -259.09 | (233) |
| | Sity Gen | | y 1 V 3 | | | | | | | | | | -209.09 | (200) |

| Total delivered energy for all uses (211)(221) + (2 | 231) + (232)(237b) = | | 4364.47 (338) |
|---|------------------------------------|---|--|
| 10a. Fuel costs - individual heating systems: | | | |
| | Fuel kWh/year | Fuel Price (Table 12) | Fuel Cost £/year |
| Space heating - main system 1 | (211) x | 3.48 × 0.01 = | 81.17 (240) |
| Space heating - main system 2 | (213) x | 0 × 0.01 = | 0 (241) |
| Space heating - secondary | (215) x | 13.19 × 0.01 = | 0 (242) |
| Water heating cost (other fuel) | (219) | 3.48 × 0.01 = | 52.54 (247) |
| Pumps, fans and electric keep-hot | (231) | 13.19 × 0.01 = | 39.27 (249) |
| (if off-peak tariff, list each of (230a) to (230g) separ- Energy for lighting | ately as applicable and a (232) | pply fuel price according to 13.19 x 0.01 = | Table 12a 63.81 (250) |
| Additional standing charges (Table 12) | | | 120 (251) |
| | one of (233) to (235) x) | 13.19 x 0.01 = | 0 (252) |
| Appendix Q items: repeat lines (253) and (254) as a Total energy cost (245)(247) | needed + (250)(254) = | | 356.79 (255) |
| 11a. SAP rating - individual heating systems | | | |
| Energy cost deflator (Table 12) | | | 0.42 (256) |
| |)] ÷ [(4) + 45.0] = | | 0.92 (257) |
| SAP rating (Section 12) | | | 87.14 (258) |
| 12a. CO2 emissions – Individual heating systems | including micro-CHP | | |
| | Energy kWh/year | Emission factor kg CO2/kWh | Em<mark>issio</mark>ns kg CO2/year |
| Space heating (main system 1) | (211) x | 0.216 = | 503.78 (261) |
| Space heating (secondary) | (215) x | 0.519 = | 0 (263) |
| Water heating | (219) x | 0.216 = | 326.09 (264) |
| Space and water heating | (261) + (262) + (263) + (264) = | = | 829.87 (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x | 0.519 = | 154.53 (267) |
| Electricity for lighting | (232) x | 0.519 = | 251.09 (268) |
| Energy saving/generation technologies Item 1 | | 0.519 = | -134.47 (269) |
| Total CO2, kg/year | SL | um of (265)(271) = | 1101.03 (272) |
| CO2 emissions per m ² | (2 | 72) ÷ (4) = | 9.36 (273) |
| El rating (section 14) | | | 91 (274) |
| 13a. Primary Energy | | | |
| | Energy kWh/year | Primary factor | P. Energy kWh/year |
| Space heating (main system 1) | (211) x | 1.22 = | 2845.45 (261) |

| Space heating (secondary) | (215) x | 3.07 | = | 0 | (263) |
|---|-----------------------------|---------------------|---|---------|-------|
| Energy for water heating | (219) x | 1.22 | = | 1841.81 | (264) |
| Space and water heating | (261) + (262) + (263) + (26 | 4) = | | 4687.25 | (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x | 3.07 | = | 914.06 | (267) |
| Electricity for lighting | (232) x | 0 | = | 1485.28 | (268) |
| Energy saving/generation technologies | | | | | |
| Item 1 | | 3.07 | = | -795.39 | (269) |
| 'Total Primary Energy | | sum of (265)(271) = | | 6291.2 | (272) |
| Primary energy kWh/m²/year | | (272) ÷ (4) = | | 53.5 | (273) |



| | | | User D | etails: | | | | | | |
|---|---|----------------|---------------------|----------------------|-------------|-------------|-----------------------|--------------|-----------------------------------|---------------------|
| Assessor Name: Software Name: | Stroma FSAP | | | Stroma Softwa | are Ver | sion: | | | n: 1.0.5.41 | |
| | 106 Poylov Poo | | | Address: | Unit 14 | - 3B 6P | - Be Gr | een | | |
| Address : 1. Overall dwelling dime | 106 Bexley Roa | a , Entri , DA | 18 355 | | | | | | | |
| Ground floor | | | - | a(m²) 17.6 | (1a) x | | ight(m) 2.7 | (2a) = | Volume(m ³) 317.52 | (3a) |
| Total floor area TFA = (1a | a)+(1b)+(1c)+(1d)+ | +(1e)+(1n | I) 1 | 17.6 | (4) | | | - | | - |
| Dwelling volume | | | · | | |)+(3c)+(3d | l)+(3e)+ | .(3n) = | 317.52 | (5) |
| 2. Ventilation rate: | | - | | _ | | _ | | | | |
| Number of chimneys | main heating | | y] + [] + [| 0 |] = [| total 0 | | 40 = 20 = | m ³ per hour | (6a) |
| Number of open flues | 0 | 0 |] . L | 0 | ŢŢ | 0 | | | 0 | (6b) |
| Number of intermittent far | าร | | | | | 0 | x ? | 10 = | 0 | (7a) |
| Number of passive vents | | | | | | 0 | x ? | 10 = | 0 | (7b) |
| Number of flueless gas fir | res | | | | | 0 | X 4 | 40 = | o anges per ho | (7c) ur |
| Infiltration due to chimney | s, flues and fans : | = (6a)+(6b)+(7 | a)+(7b)+(1 | 7c) = | Г | 0 | <u> </u> | ÷ (5) = | 0 | (8) |
| <i>If a pressurisation test has be</i> Number of storeys in th Additional infiltration Structural infiltration: 0. | en carried out or is int e dwelling (ns) | ended, proceed | d to (17), c | otherwise c | | om (9) to (| (16) | -1]x0.1 = | 0 0 0 | (9) (10) (11) |
| if both types of wall are pro deducting areas of openin If suspended wooden fl | gs); if equal user 0.35 | | - | | | | | | 0 | _](12) |
| If no draught lobby, ent | | , | (| -,, | | | | | 0 | (13) |
| Percentage of windows | | | | | | | | | 0 | (14) |
| Window infiltration | | | | 0.25 - [0.2 | x (14) ÷ 1 | = [00 | | | 0 | (15) |
| Infiltration rate | | | | (8) + (10) | + (11) + (1 | 2) + (13) - | + (15) = | | 0 | (16) |
| Air permeability value, | | | • | • | • | etre of e | envelope | area | 4 | (17) |
| If based on air permeabili | - | | | | | | | | 0.2 | (18) |
| Air permeability value applies Number of sides sheltered | | t has been don | e or a deg | gree air pei | rmeability | is being us | sed | | | |
| Shelter factor | u | | | (20) = 1 - | [0.075 x (1 | 9)] = | | | 1 0.92 | (19) (20) |
| Infiltration rate incorporati | ng shelter factor | | | (21) = (18) |) x (20) = | | | | 0.19 | (21) |
| Infiltration rate modified for | - | eed | | | | | | | 0.10 |](=1) |
| r | | lay Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Monthly average wind spe | - I · I | | | | | | | | | |
| r r | 4.9 4.4 4. | 3 3.8 | 3.8 | 3.7 | 4 | 4.3 | 4.5 | 4.7 | | |
| Wind Factor (22a)m = (22 | ?)m ÷ 4 | | | | | | | | I | |
| (22a)m= 1.27 1.25 1 | 1.23 1.1 1.0 | 0.95 | 0.95 | 0.92 | 1 | 1.08 | 1.12 | 1.18 | | |
| | | | | | | | | | | |

| Adjuste | ed infiltr | ation rat | e (allowi | ing for sh | elter an | d wind s | peed) = | (21a) x | (22a)m | | | | | |
|------------------|------------|---------------------------------|---------------------------|-------------------------------|---------------|----------------|-------------|-------------------------------|--------------|---------------|------------------|-----------|-------------|----------------|
| <u> </u> | 0.24 | 0.23 | 0.23 | 0.2 | 0.2 | 0.18 | 0.18 | 0.17 | 0.19 | 0.2 | 0.21 | 0.22 | | |
| | | c <i>tive air</i> al ventila | - | rate for ti | he applic | cable ca | se | | | | | | 0.5 | (23a) |
| | | | | endix N, (2 | 3b) = (23a |) x Fmv (e | equation (N | (5)) othe | rwise (23h | (23a) | | | 0.5 | (23a) (23b) |
| | | | | iency in % | | | | | | <i>(</i> 200) | | | 0.5 | |
| | | | - | - | - | | | | | 0h), m. i (| 22h) [| 1 (22-) | 78.2 | (23c) |
| a) II (24a)m= | 0.34 | 0.34 | | entilation | 0.31 | 0.28 | 0.28 | 0.28 | 0.29 | 0.31 | 230) × [0.32 | 0.33 | - 100j] | (24a) |
| | | | | | | | | | | | | 0.55 | l | (244) |
| , | | | | entilation | | neat rec | | 0 0 | m = (22) | 20)m + (0 | 230) | 0 | 1 | (24b) |
| (24b)m= | - | - | | | - | • | - | - | | 0 | 0 | 0 | | (240) |
| | | | | ntilation c then (24c | - | - | | | | 5 x (23) | 2) | | | |
| (24c)m= | | 0 | | |) = (200 0 | | 0 | $\frac{0}{0} = \frac{221}{2}$ | | | 0 | 0 | 1 | (24c) |
| | | _ | | lole hous | • | Ũ | | | - | | | | l | (/ |
| , | | | | m = (22t) | | • | | | | 0.5] | | | | |
| (24d)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (24d) |
| Effe | ctive air | change | rate - er | nter (24a |) or (24b |) or (24 | c) or (24 | d) in box | (25) | | | | 1 | |
| (25)m= | 0.34 | 0.34 | 0.34 | 0.31 | 0.31 | 0.28 | 0.28 | 0.28 | 0.29 | 0.31 | 0.32 | 0.33 | | (25) |
| | | | 1 | | | | 1 | | I | | | | | |
| | | | | paramete | | | | | | | | | | |
| ELEN | | Gros area | | Openin m | | Net Ar A ,r | | U-valu W/m2 | | A X U (W/ | | k-value | | A X k kJ/K |
| Doors | | | | | | 1.91 | x | 1 | | 1.91 | | | | (26) |
| Window | ws Type | e 1 | | | | 1.28 | | /[1/(1.2)+ | | 1.47 | Ħ | | | (27) |
| | ws Type | | | | | 1.28 | | /[1/(1.2)+ | | 1.47 | Ħ | | | (27) |
| | ws Type | | | | | | | /[1/(1.2)+ | | | 4 | | | |
| | | | | | | 4.09 | = | | | 4.68 | | | | (27) |
| | ws Type | | | | | 6.14 | | /[1/(1.2)+ | 0.04] = | 7.03 | ╡, | | | (27) |
| Walls 1 | | 92.8 | 38 | 17.26 | <u>}</u> | 75.62 | <u>2</u> X | 0.16 | = | 12.1 | _ ļ | | \dashv | (29) |
| Walls 7 | l ype2 | 28.3 | 35 | 0 | | 28.35 | 5 X | 0.15 | = | 4.26 | | | | (29) |
| Roof | | 117 | .6 | 0 | | 117.6 | 3 X | 0.11 | = | 12.94 | | | | (30) |
| Total a | rea of e | elements | s, m² | | | 238.8 | 3 | | | | | | | (31) |
| Party v | vall | | | | | 7.02 | x | 0 | = | 0 | | | | (32) |
| Party f | loor | | | | | 117.6 | 6 | | | | [| | | (32a) |
| | | | | effective wil nternal wall | | | ated using | formula 1 | /[(1/U-valı | ıe)+0.04] a | as given in | paragraph | 1 3.2 | |
| Fabric | heat los | ss, W/K | = S (A x | U) | | | | (26)(30) |) + (32) = | | | | 48.78 | 8 (33) |
| Heat c | apacity | Cm = S | (A x k) | | | | | | ((28). | (30) + (3 | 2) + (32a). | (32e) = | 13812 | 2.5 (34) |
| Therma | al mass | parame | eter (TMF | ⊃ = Cm ÷ | TFA) in | ⊨kJ/m²K | | | Indica | itive Value | : Medium | | 250 | (35) |
| | - | | ere the de tailed calc | etails of the ulation. | constructi | on are not | t known pr | ecisely the | e indicative | e values of | TMP in Ta | able 1f | | |
| Therma | al bridg | es : S (L | x Y) cal | culated u | using Ap | pendix ł | < | | | | | | 6.63 | (36) |
| if details | of therma | al bridging | are not kn | nown (36) = | = 0.05 x (3 | 1) | | | | | | | | |
| Total fa | abric he | at loss | | | | | | | (33) + | (36) = | | | 55.41 | 1 (37) |

| Ventila | ation hea | at loss ca | alculated | monthl | у | | _ | | (38)m | = 0.33 × (| 25)m x (5) | | | |
|-------------------------|----------------------------------|-----------------------|------------|--|-----------------------------|-------------|------------|-----------------------------|--------------|------------------------|---------------------------------------|---------|---------|------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| (38)m= | 36.14 | 35.65 | 35.17 | 32.74 | 32.26 | 29.84 | 29.84 | 29.35 | 30.81 | 32.26 | 33.23 | 34.2 | | (38) |
| Heat ti | ransfer o | coefficie | nt, W/K | | | | | | (39)m | = (37) + (3 | 38)m | | | |
| (39)m= | 91.55 | 91.06 | 90.58 | 88.16 | 87.67 | 85.25 | 85.25 | 84.76 | 86.22 | 87.67 | 88.64 | 89.61 | | |
| Heat lo | oss para | imeter (I | HLP), W | /m²K | | | | | | Average = = (39)m ÷ | Sum(39)₁. · (4) | 12 /12= | 88.04 | (39) |
| (40)m= | 0.78 | 0.77 | 0.77 | 0.75 | 0.75 | 0.72 | 0.72 | 0.72 | 0.73 | 0.75 | 0.75 | 0.76 | | |
| Numbe | er of day | /s in mo | nth (Tab | le 1a) | | | • | • | , | Average = | Sum(40)1. | 12 /12= | 0.75 | (40) |
| | 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. Wa | ater heat | ting ene | rgy requ | irement: | | | | | | | | kWh/ye | ear: | |
| if TF if TF Annua | A > 13.9 A £ 13.9 I averag | 9, N = 1 je hot wa | + 1.76 × | ge in litre | (-0.0003 es per da | ay Vd,av | erage = | (25 x N) | + 36 | | .9) | 85 | | (42) |
| | | | | | 5% if the a vater use, l | - | - | to achieve | a water us | se target o | f | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
| Hot wate | | | | | Vd,m = fa | | | | 000 | | | | | |
| (44)m= | 112.17 | 108.09 | 104.01 | 99.93 | 95.85 | 91.77 | 91.77 | 95.85 | 99.93 | 104.01 | 108.09 | 112.17 | | |
| Energy | content of | hot water | used - ca | culated me | onthly $= 4$. | 190 x Vd,r | n x nm x E |)) Tm / 3600 | | | m(44) ₁₁₂ = ables 1b, 1 | | 1223.66 | (44) |
| (45)m= | 166.34 | 145.48 | 150.13 | 130.88 | 125.59 | 108.37 | 100.42 | 115.24 | 116.61 | 135.9 | 148.35 | 161.09 | | |
| lf instan | taneous w | vater heati | ng at poin | t of use (no | o hot water | r storage), | enter 0 in | boxes (46 | | Fotal = Su | m(45) ₁₁₂ = | | 1604.41 | (45) |
| | 24.95 | 21.82 | 22.52 | 19.63 | 18.84 | 16.26 | 15.06 | 17.29 | 17.49 | 20.39 | 22.25 | 24.16 | | (46) |
| | storage | | I P | | | | | 111 1 | | 1 | | | 1 | (|
| | | | | 0 , | olar or W | | 0 | | ame ves | sel | | 0 | I | (47) |
| Otherv | | o stored | | | velling, e ncludes i | | | • • | ers) ente | er '0' in (| 47) | | | |
| | - | | eclared I | oss facto | or is kno | wn (kWł | n/day): | | | | | 0 | | (48) |
| Tempe | erature f | actor fro | m Table | 2b | | | | | | | | 0 | | (49) |
| | | | - | e, kWh/ye | ear loss fact | or is not | | (48) x (49) |) = | | | 0 | | (50) |
| Hot wa | ater stora | age loss | factor f | rom Tab | le 2 (kW | | | | | | | 0 |] | (51) |
| | • | from Ta | ee secti | on 4.3 | | | | | | | | 0 | | (52) |
| | | | m Table | 2b | | | | | | | | 0 0 | | (52) |
| | | | | e, kWh/ye | ear | | | (47) x (51) |) x (52) x (| 53) = | | 0 | | (54) |
| | | (54) in (5 | - | , , , , , , , , , , , , , , , , , , , , | | | | () ··· () ··· () ··· () | / (| | | 0 | | (55) |
| Water | storage | loss cal | culated | for each | month | | | ((56)m = (| 55) × (41)ı | m | <u> </u> | | | |
| (56)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (56) |

| If cylinde | er contains | s dedicated | solar sto ^ا | rage, (57)r | n = (56)m | x [(50) – (I | H11)] ÷ (50 | 0), else (57 | 7)m = (56) | m where (| H11) is fro | m Append | lix H | |
|--|--|--|---|--|--|---|---|--|---|--|--|---|---------------|--|
| (57)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (57) |
| Primar | y circuit | loss (an | nual) frc | om Table | 3 | | | | | | | 0 | | (58) |
| Primar | y circuit | loss cal | culated f | for each | month (| 59)m = (| 58) ÷ 36 | 5 × (41) | m | | | | | |
| (moo | dified by | factor fr | om Tabl | le H5 if tl | here is s | olar 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 | culated | for each | month (| 61)m = (| (60) ÷ 36 | 5 × (41) | m | | | | | | |
| (61)m= | 24.91 | 22.5 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | 24.91 | 24.11 | 24.91 | 24.11 | 24.91 | | (61) |
| Total h | eat requ | uired for | water he | eating ca | lculated | for each | ו month | (62)m = | 0.85 × (| 45)m + | (46)m + | (57)m + | (59)m + (61)m | |
| (62)m= | 191.26 | 167.99 | 175.04 | 154.99 | 150.5 | 132.48 | 125.34 | 140.15 | 140.72 | 160.81 | 172.46 | 186.01 | | (62) |
| Solar DH | HW input o | calculated | using App | endix G or | Appendix | H (negativ | /e quantity | ') (enter '0' | if no sola | r contributi | on to wate | er heating) | | |
| (add a | dditiona | l lines if | FGHRS | and/or V | VWHRS | applies, | see Ap | pendix G | G) | | | | | |
| (63)m= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | (63) |
| FHRS | 18.71 | 16.18 | 15.99 | 13.31 | 10.64 | 8.53 | 8.11 | 9.17 | 9.23 | 14.09 | 16.23 | 18.34 | | (63) (G2) |
| WWHR | 5 -43.72 | -38.47 | -39.26 | -32.3 | -29.99 | -24.73 | -20.93 | -25.34 | -26.08 | -32.25 | -37.36 | -42.26 | | (63) (G10) |
| Output | from w | ater heat | ter | | | | | | | | | | | |
| (64)m= | 127.53 | 112.17 | 118.49 | 108.14 | 108.58 | 97.97 | 95.02 | 104.35 | 104.16 | 113.19 | 117.61 | 124.12 | | _ |
| | | | | | | | | Outp | out from wa | ater heatei | (annual)₁ | 12 | 1331.34 | (64) |
| Hea <mark>t g</mark> | ains froi | m wat <mark>er</mark> | heating, | kWh/mc | onth 0.25 | 5 (0.85 | × (45)m | + (61)m |] + 0.8 × | (<mark>46)m</mark> | + (57)m | + (59)m |] | |
| (65)m= | 61.54 | 54 | 56.15 | 49.55 | 47.99 | 42.06 | 39.62 | 44.54 | 44.8 | 5 <mark>1.42</mark> | 55.35 | 5 <mark>9.79</mark> | | (65) |
| (/··· | | | | | | | | | | | | | | |
| | | | | of (65)m | | | s in the c | dwelling | or hot w | | om com | munity h | leating | |
| inclu | ıde (57)ı | m in calc | ulation o | LI | only if c | | s in the c | dwelling | or hot w | | om com | munity h | leating | |
| inclu 5. Int | ıde (57)ı ternal ga | m in calc | culation of Table 5 | of (65)m | only if c | | s in the c | dwelling | or hot w | | om com | munity h | leating | |
| inclu 5. Int | ıde (57)ı ternal ga | m in calc ains (see | culation of Table 5 | of (65)m | only if c | | s in the c | dwelling | or hot w Sep | | om com Nov | munity h | leating | |
| inclu 5. Int | ide (57)i iemal ga olic gain | m in calc ains (see s (Table | culation of Table 5 | of (65)m and 5a) ts | only if c | ylinder is | | | | ater is fr | | | leating | (66) |
| inclu 5. Int Metabo (66)m= | ide (57)i ernal ga olic gain Jan 142.68 | m in calc ains (see s (Table Feb 142.68 | culation of Table 5 5), Watt Mar 142.68 | of (65)m 5 and 5a) ts Apr | only if c : May 142.68 | ylinder is Jun 142.68 | Jul 142.68 | Aug 142.68 | Sep 142.68 | ater is fr Oct | Nov | Dec | leating | |
| inclu 5. Int Metabo (66)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains | m in calc ains (see s (Table Feb 142.68 | culation of Table 5 5), Watt Mar 142.68 | of (65)m 5 and 5a) ts Apr 142.68 | only if c : May 142.68 | ylinder is Jun 142.68 | Jul 142.68 | Aug 142.68 | Sep 142.68 | ater is fr Oct | Nov | Dec | leating | |
| inclu 5. Int Metabo (66)m= Lightin (67)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 | Table 5 5), Wat Mar 142.68 ted in Ap 19.79 | of (65)m and 5a) ts Apr 142.68 opendix L | May 142.68 L, equati 11.2 | Jun 142.68 on L9 or 9.45 | Jul 142.68 r L9a), al 10.22 | Aug 142.68 Iso see 13.28 | Sep 142.68 Table 5 17.82 | Oct 142.68 22.63 | Nov 142.68 | Dec 142.68 | leating | (66) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 | Table 5 5), Wat Mar 142.68 ted in Ap 19.79 | of (65)m 5 and 5a) ts Apr 142.68 5pendix L 14.98 | May 142.68 L, equati 11.2 | Jun 142.68 on L9 or 9.45 | Jul 142.68 r L9a), al 10.22 | Aug 142.68 Iso see 13.28 | Sep 142.68 Table 5 17.82 | Oct 142.68 22.63 | Nov 142.68 | Dec 142.68 | leating | (66) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga 282.05 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calc 284.98 | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in 277.61 | of (65)m and 5a) ts Apr 142.68 ppendix L 14.98 Append | only if c : May 142.68 L, equati 11.2 dix L, equ 242.08 | ylinder is Jun 142.68 fon L9 or 9.45 uation L ¹ 223.46 | Jul 142.68 142.68 10.22 13 or L13 211.01 | Aug 142.68 Iso see ⁻ 13.28 3a), also 208.08 | Sep 142.68 Table 5 17.82 see Tal 215.46 | ater is fr Oct 142.68 22.63 ble 5 231.16 | Nov 142.68 26.41 | Dec 142.68 28.16 | leating | (66) (67) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga 282.05 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calc 284.98 | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in 277.61 | of (65)m and 5a) ts Apr 142.68 ppendix L 14.98 Append 261.9 | only if c : May 142.68 L, equati 11.2 dix L, equ 242.08 | ylinder is Jun 142.68 fon L9 or 9.45 uation L ¹ 223.46 | Jul 142.68 142.68 10.22 13 or L13 211.01 | Aug 142.68 Iso see ⁻ 13.28 3a), also 208.08 | Sep 142.68 Table 5 17.82 see Tal 215.46 | ater is fr Oct 142.68 22.63 ble 5 231.16 | Nov 142.68 26.41 | Dec 142.68 28.16 | leating | (66) (67) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga 282.05 ng gains 37.27 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calcu 284.98 (calcula | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in 277.61 ted in Ap 37.27 | of (65)m and 5a) ts Apr 142.68 opendix L 14.98 Append 261.9 opendix 37.27 | May 142.68 L, equati 11.2 dix L, equ 242.08 L, equat | ylinder is Jun 142.68 on L9 or 9.45 uation L1 223.46 ion L15 | Jul 142.68 r L9a), al 10.22 13 or L13 211.01 or L15a) | Aug 142.68 Iso see 13.28 3a), also 208.08 , also se | Sep 142.68 Table 5 17.82 see Tal 215.46 ee Table | ater is fr Oct 142.68 22.63 ble 5 231.16 5 | Nov 142.68 26.41 250.98 | Dec 142.68 28.16 269.61 | leating | (66) (67) (68) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga 282.05 ng gains 37.27 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calculat 284.98 (calcula 37.27 | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in 277.61 ted in Ap 37.27 | of (65)m and 5a) ts Apr 142.68 opendix L 14.98 Append 261.9 opendix 37.27 | May 142.68 L, equati 11.2 dix L, equ 242.08 L, equat | ylinder is Jun 142.68 on L9 or 9.45 uation L1 223.46 ion L15 | Jul 142.68 r L9a), al 10.22 13 or L13 211.01 or L15a) | Aug 142.68 Iso see 13.28 3a), also 208.08 , also se | Sep 142.68 Table 5 17.82 see Tal 215.46 ee Table | ater is fr Oct 142.68 22.63 ble 5 231.16 5 | Nov 142.68 26.41 250.98 | Dec 142.68 28.16 269.61 | leating | (66) (67) (68) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga 282.05 ng gains 37.27 s and far 3 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calculat 284.98 (calcula 37.27 ns gains 3 | Culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in 277.61 ted in Ap 37.27 (Table 5 3 | of (65)m 5 and 5a) ts Apr 142.68 ppendix L 14.98 Appendix 261.9 ppendix 37.27 5a) | Only if c May 142.68 L, equati 11.2 Jix L, equ 242.08 L, equati 37.27 | ylinder is Jun 142.68 ion L9 or 9.45 uation L1 223.46 ion L15 o 37.27 | Jul 142.68 129a), a 10.22 13 or L13 211.01 or L15a) 37.27 | Aug 142.68 Iso see - 13.28 3a), also 208.08 , also se 37.27 | Sep 142.68 Table 5 17.82 see Tal 215.46 ee Table 37.27 | ater is fr Oct 142.68 22.63 ble 5 231.16 5 37.27 | Nov 142.68 26.41 250.98 37.27 | Dec 142.68 28.16 269.61 37.27 | leating | (66) (67) (68) (69) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga 282.05 ng gains 37.27 s and far 3 s e.g. ev | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calculat 284.98 (calcula 37.27 ns gains 3 | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in Ap 277.61 ted in Ap 37.27 (Table 5 3 n (negat | of (65)m and 5a) ts Apr 142.68 ppendix L 14.98 Appendix 261.9 ppendix 37.27 5a) 3 | Only if c May 142.68 L, equati 11.2 Jix L, equ 242.08 L, equati 37.27 | ylinder is Jun 142.68 fon L9 or 9.45 uation L1 223.46 ion L15 o 37.27 3 le 5) | Jul 142.68 129a), a 10.22 13 or L13 211.01 or L15a) 37.27 | Aug 142.68 Iso see - 13.28 3a), also 208.08 , also se 37.27 | Sep 142.68 Table 5 17.82 see Tal 215.46 ee Table 37.27 | ater is fr Oct 142.68 22.63 ble 5 231.16 5 37.27 | Nov 142.68 26.41 250.98 37.27 | Dec 142.68 28.16 269.61 37.27 | leating | (66) (67) (68) (69) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga 282.05 ng gains 37.27 and far 3 s e.g. ev -114.14 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calculat 284.98 (calcula 37.27 ns gains 3 aporatio | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in 277.61 ted in Ap 37.27 (Table 5 3 n (negat -114.14 | of (65)m and 5a) ts Apr 142.68 ppendix L 14.98 Appendix 261.9 ppendix 37.27 5a) 3 | only if c May 142.68 1, equati 11.2 dix L, equ 242.08 L, equati 37.27 3 es) (Tab | ylinder is Jun 142.68 fon L9 or 9.45 uation L1 223.46 ion L15 o 37.27 3 le 5) | Jul 142.68 142.68 10.22 13 or L13 211.01 or L15a) 37.27 3 | Aug 142.68 Iso see 7 13.28 3a), also 208.08 1, also se 37.27 3 | Sep 142.68 Table 5 17.82 see Tal 215.46 ee Table 37.27 3 | ate r is fr Oct 142.68 22.63 ble 5 231.16 5 37.27 3 | Nov 142.68 26.41 250.98 37.27 3 | Dec 142.68 28.16 269.61 37.27 3 | leating | (66) (67) (68) (69) (70) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces ga 282.05 ng gains 37.27 and far 3 s e.g. ev -114.14 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calculat 284.98 (calcula 37.27 ns gains 3 aporatio -114.14 | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in 277.61 ted in Ap 37.27 (Table 5 3 n (negat -114.14 | of (65)m and 5a) ts Apr 142.68 ppendix L 14.98 Appendix 261.9 ppendix 37.27 5a) 3 | only if c May 142.68 1, equati 11.2 dix L, equ 242.08 L, equati 37.27 3 es) (Tab | ylinder is Jun 142.68 fon L9 or 9.45 uation L1 223.46 ion L15 o 37.27 3 le 5) | Jul 142.68 142.68 10.22 13 or L13 211.01 or L15a) 37.27 3 | Aug 142.68 Iso see 7 13.28 3a), also 208.08 1, also se 37.27 3 | Sep 142.68 Table 5 17.82 see Tal 215.46 ee Table 37.27 3 | ate r is fr Oct 142.68 22.63 ble 5 231.16 5 37.27 3 | Nov 142.68 26.41 250.98 37.27 3 | Dec 142.68 28.16 269.61 37.27 3 | leating | (66) (67) (68) (69) (70) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces gai 282.05 ng gains 37.27 s and far 3 s e.g. ev -114.14 heating 82.71 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calculat 284.98 (calcula 37.27 ns gains 3 aporatio -114.14 gains (T | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in Ap 277.61 ted in Ap 37.27 (Table 5 3 n (negat -114.14 able 5) 75.46 | of (65)m and 5a) ts Apr 142.68 opendix L 14.98 Appendix 261.9 opendix 37.27 5a) 3 tive value -114.14 | only if c May 142.68 L, equati 11.2 Jix L, equ 242.08 L, equati 37.27 3 es) (Tab -114.14 | ylinder is Jun 142.68 on L9 or 9.45 uation L1 223.46 ion L15 o 37.27 3 le 5) -114.14 58.42 | Jul 142.68 L9a), a 10.22 13 or L13 211.01 or L15a) 37.27 3 -114.14 | Aug 142.68 lso see 7 13.28 3a), also 208.08 0, also se 37.27 3 -114.14 59.87 | Sep 142.68 Table 5 17.82 see Tal 215.46 ee Table 37.27 3 -114.14 | ate r is fr Oct 142.68 22.63 ble 5 231.16 5 37.27 3 -114.14 69.11 | Nov 142.68 26.41 250.98 37.27 3 -114.14 76.88 | Dec 142.68 28.16 269.61 37.27 3 -114.14 80.37 | leating | (66) (67) (68) (69) (70) (71) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (71)m= Water (72)m= | ide (57)i ernal ga olic gain Jan 142.68 g gains 27.39 nces gai 282.05 ng gains 37.27 s and far 3 s e.g. ev -114.14 heating 82.71 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calculat 37.27 ns gains 3 aporatio -114.14 gains (T 80.36 | culation of Table 5 5), Watt Mar 142.68 ted in Ap 19.79 ulated in Ap 277.61 ted in Ap 37.27 (Table 5 3 n (negat -114.14 able 5) 75.46 | of (65)m and 5a) ts Apr 142.68 opendix L 14.98 Appendix 261.9 opendix 37.27 5a) 3 tive value -114.14 | only if c May 142.68 L, equati 11.2 Jix L, equ 242.08 L, equati 37.27 3 es) (Tab -114.14 | ylinder is Jun 142.68 on L9 or 9.45 uation L1 223.46 ion L15 o 37.27 3 le 5) -114.14 58.42 | Jul 142.68 129a), al 10.22 13 or L13 211.01 or L15a) 37.27 3 -114.14 | Aug 142.68 lso see 7 13.28 3a), also 208.08 0, also se 37.27 3 -114.14 59.87 | Sep 142.68 Table 5 17.82 see Tal 215.46 ee Table 37.27 3 -114.14 | ate r is fr Oct 142.68 22.63 ble 5 231.16 5 37.27 3 -114.14 69.11 | Nov 142.68 26.41 250.98 37.27 3 -114.14 76.88 | Dec 142.68 28.16 269.61 37.27 3 -114.14 80.37 | leating | (66) (67) (68) (69) (70) (71) |
| inclu 5. Int Metabo (66)m= Lightin (67)m= Applian (68)m= Cookin (69)m= Pumps (70)m= Losses (70)m= Usses (71)m= Water (72)m= Total i (73)m= | ide (57)i iernal ga gain Jan 142.68 g gains 27.39 nces ga 282.05 ng gains 37.27 s and far 3 s e.g. ev -114.14 heating 82.71 nternal 142.68 | m in calc ains (see s (Table Feb 142.68 (calculat 24.33 ins (calculat 284.98 (calculat 37.27 ns gains 3 aporatio -114.14 gains (T 80.36 gains = 458.47 | Culation of Table 5 5), Watter Mar 142.68 ted in Ap 19.79 ulated in 277.61 ted in Ap 37.27 (Table 5 3 n (negat -114.14 table 5) 75.46 | of (65)m 5 and 5a) ts Apr 142.68 opendix L 14.98 o Appendix 261.9 opendix 37.27 5a) 3 tive value -114.14 | only if c may 142.68 _, equati 11.2 dix L, equ 242.08 L, equat 37.27 3 es) (Tab -114.14 64.5 | ylinder is Jun 142.68 fon L9 or 9.45 uation L1 223.46 ion L15 o 37.27 3 le 5) -114.14 58.42 (66) | Jul 142.68 • L9a), a 10.22 13 or L13 211.01 or L15a) 37.27 3 -114.14 53.25 m + (67)m | Aug 142.68 Iso see 13.28 3a), also 208.08 37.27 3 -114.14 59.87 + (68)m + | Sep 142.68 Table 5 17.82 See Tal 215.46 ee Table 37.27 3 -114.14 | ate r is fr Oct 142.68 22.63 ble 5 231.16 5 37.27 3 -114.14 69.11 70)m + (7 | Nov 142.68 26.41 250.98 37.27 3 -114.14 76.88 1)m + (72) | Dec 142.68 28.16 269.61 37.27 3 -114.14 80.37 m | | (66) (67) (68) (69) (70) (71) (72) |

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

| Orientati | on: | Access Factor Table 6d | r | Area m² | | Flux Table 6a | | g_ Table 6b | | FF Table 6c | | Gains (W) | |
|-----------|------|---------------------------|---|------------|---|------------------|---|----------------|---|----------------|---|--------------|------|
| North | 0.9x | 0.77 | x | 1.28 | × | 10.63 | × | 0.63 | x | 0.7 | = | 12.48 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 10.63 | x | 0.63 | x | 0.7 | = | 13.29 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 20.32 | x | 0.63 | x | 0.7 | = | 23.85 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 20.32 | × | 0.63 | x | 0.7 | = | 25.4 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 34.53 | x | 0.63 | x | 0.7 | = | 40.52 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 34.53 | x | 0.63 | x | 0.7 | = | 43.16 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 55.46 | x | 0.63 | x | 0.7 | = | 65.09 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 55.46 | × | 0.63 | x | 0.7 | = | 69.33 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 74.72 | × | 0.63 | x | 0.7 | = | 87.68 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 74.72 | x | 0.63 | x | 0.7 | = | 93.39 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 79.99 | × | 0.63 | x | 0.7 | = | 93.87 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 79.99 | × | 0.63 | x | 0.7 | = | 99.98 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 74.68 | x | 0.63 | x | 0.7 | = | 87.64 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 74.68 | x | 0.63 | x | 0.7 | = | 93.34 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 59.25 | x | 0.63 | x | 0.7 | = | 69.53 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | × | 59.25 | x | 0.63 | х | 0.7 | = | 74.06 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 41.52 | x | 0.63 | x | 0.7 | = | 48.72 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 41.52 | × | 0.63 | × | 0.7 | = | 51.89 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | X | 24.19 | × | 0.63 | × | 0.7 | = | 28.39 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | × | 24.19 | х | 0.63 | × | 0.7 | = | 30.24 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | × | 13.12 | × | 0.63 | × | 0.7 | = | 15.39 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | × | 13.12 | × | 0.63 | x | 0.7 | = | 16.4 | (74) |
| North | 0.9x | 0.77 | x | 1.28 | x | 8.86 | x | 0.63 | x | 0.7 | = | 10.4 | (74) |
| North | 0.9x | 0.77 | x | 4.09 | x | 8.86 | × | 0.63 | x | 0.7 | = | 11.08 | (74) |
| East | 0.9x | - | x | 6.14 | x | 19.64 | x | 0.63 | x | 0.7 | = | 36.85 | (76) |
| East | 0.9x | | x | 6.14 | × | 38.42 | × | 0.63 | x | 0.7 | = | 72.09 | (76) |
| East | 0.9x | | x | 6.14 | x | 63.27 | × | 0.63 | x | 0.7 | = | 118.73 | (76) |
| East | 0.9x | | x | 6.14 | x | 92.28 | × | 0.63 | x | 0.7 | = | 173.16 | (76) |
| East | 0.9x | | x | 6.14 | x | 113.09 | × | 0.63 | x | 0.7 | = | 212.21 | (76) |
| East | 0.9x | | x | 6.14 | x | 115.77 | X | 0.63 | X | 0.7 | = | 217.24 | (76) |
| East | 0.9x | - | x | 6.14 | × | 110.22 | × | 0.63 | x | 0.7 | = | 206.82 | (76) |
| East | 0.9x | | x | 6.14 | X | 94.68 | × | 0.63 | X | 0.7 | = | 177.66 | (76) |
| East | 0.9x | | x | 6.14 | X | 73.59 | × | 0.63 | x | 0.7 | = | 138.09 | (76) |
| East | 0.9x | | x | 6.14 | × | 45.59 | × | 0.63 | x | 0.7 | = | 85.55 | (76) |
| East | 0.9x | | X | 6.14 | × | 24.49 | × | 0.63 | x | 0.7 | = | 45.95 | (76) |
| East | 0.9x | | X | 6.14 | × | 16.15 | × | 0.63 | x | 0.7 | = | 30.31 | (76) |
| West | 0.9x | | X | 1.28 | × | 19.64 | × | 0.63 | x | 0.7 | = | 7.68 | (80) |
| West | 0.9x | | X | 1.28 | × | 38.42 | × | 0.63 | x | 0.7 | = | 15.03 | (80) |
| West | 0.9x | 0.77 | X | 1.28 | x | 63.27 | x | 0.63 | x | 0.7 | = | 24.75 | (80) |

| | г | | | | | | | | | | | | | | | |
|--------------------|---------------------|-------------------------|---------------------|--------------------|-----------|------------|-----------------|-----------|-------------|----------|---------------|-----------|--------------|-----------|--------|-------|
| West | 0.9x | 0.77 | X | 1.2 | 28 | × | 9 | 2.28 | X | 0 | 0.63 | | 0.7 | = | 36.1 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | × | 1′ | 13.09 | x | 0 | 0.63 | _ × [| 0.7 | = | 44.24 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 11 | 15.77 | x | 0 | 0.63 | × | 0.7 | = | 45.29 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | × | 11 | 10.22 | x | C | 0.63 | × | 0.7 | = | 43.12 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | × | 9 | 4.68 | x | C | 0.63 | × | 0.7 | = | 37.04 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 7 | 3.59 | x | C | 0.63 | × | 0.7 | = | 28.79 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 4 | 5.59 | x | 0 | 0.63 | × | 0.7 | = | 17.83 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x | 2 | 4.49 | x | 0 | 0.63 | × | 0.7 | = | 9.58 | (80) |
| West | 0.9x | 0.77 | x | 1.2 | 28 | x [| 1 | 6.15 | x | 0 | 0.63 | x | 0.7 | = | 6.32 | (80) |
| | | | | | | | | | | | | | | | | |
| т | | · · · · | r | for eac | | <u> </u> | | | <u> </u> | - | n(74)m . | | 1 | | 1 | |
| (83)m= | 70.31 | 136.37 | 227.17 | 343.68 | 437.53 | | 56.37 | 430.92 | 358 | .28 2 | 267.49 | 162 | 87.32 | 58.11 | | (83) |
| ŗ | | i | 1 | r (84)m = | · , | È | | | | | | | 540.4 | 505.04 | 1 | (0.4) |
| (84)m= | 531.27 | 594.85 | 668.83 | 758.18 | 824.11 | 8 | 16.5 | 774.2 | 708 | .31 | 631.8 | 553.7 | 510.4 | 505.04 | | (84) |
| | | | | (heating | | <i>,</i> | | | | | | | | | - | |
| • | | • | • • | periods ir | | - | | | ole 9, | Th1 | (°C) | | | | 21 | (85) |
| Utilisa r | tion fac | <u> </u> | 1 | living are | 1 | (se | ee Ta | , | 1 | | | | -i | 1 | 1 | |
| - | Jan | Feb | Mar | Apr | May | | Jun | Jul | | ug | Sep | Oct | Nov | Dec | | |
| (86)m= | 1 | 1 | 1 | 0.97 | 0.87 | 0 |).66 | 0.48 | 0.5 | 5 | 0.85 | 0.99 | 1 | 1 | | (86) |
| Me <mark>an</mark> | interna | l temp <mark>e</mark> r | ature in | living are | ea T1 (fo | ollo | w ste | ps 3 to 7 | ' in T | able | 9c) | | | | | |
| (87)m= | <mark>2</mark> 0.15 | 20.25 | 20.44 | 20.72 | 20.92 | 2 | 0.99 | 21 | 2' | 1 | 20.95 | 20.69 | 20.38 | 20.14 | | (87) |
| Temp | erature | during h | neating p | periods in | n rest of | dw | elling | from Ta | ble 9 |), Th2 | 2 (°C) | | | | | |
| (88)m= | 2 <mark>0.27</mark> | 20.28 | 20.28 | 20.3 | 20.3 | 2 | 0.32 | 20.32 | 20. | 32 : | 20.31 | 20.3 | 20.29 | 20.29 | | (88) |
| Utilisa | tion fac | tor for g | ains for | rest of d | welling, | h2, | m (se | e Table | 9a) | | | | | | | |
| (89)m= | 1 | 1 | 0.99 | 0.96 | 0.84 | |).59 | 0.41 | 0.4 | 7 | 0.8 | 0.98 | 1 | 1 | | (89) |
| Mean | interna | I temper | ature in | the rest | of dwelli | ina | T2 (fc | ollow ste | eps 3 | to 7 i | n Tabl | e 9c) | | | | |
| (90)m= | 19.1 | 19.26 | 19.55 | 19.95 | 20.22 | <u> </u> | 0.31 | 20.32 | 20.3 | | 20.27 | 19.91 | 19.46 | 19.11 | | (90) |
| L | | 1 | | | | | | | | I | f | LA = Livi | ng area ÷ (· | 4) = | 0.31 | (91) |
| Mean | interna | l tomnor | atura (fr | or the wh | olo dwo | lling | a) – fl | Δ 🗸 Τ1 | ⊥ (1 | fΙ_Δ` |) v T2 | | | | | |
| (92)m= | 19.43 | 19.57 | 19.83 | 20.19 | 20.44 | <u> </u> | 9) — II 0.52 | 20.53 | 20. | | 20.48 | 20.15 | 19.75 | 19.43 | | (92) |
| Ľ | | | | n internal | | | | | | | | | | |] | |
| (93)m= | 19.43 | 19.57 | 19.83 | 20.19 | 20.44 | _ | 0.52 | 20.53 | 20. | | 20.48 | 20.15 | 19.75 | 19.43 | | (93) |
| 8. Spa | ace hea | ting requ | uiremen | t | | | | | I | | | | | | | |
| Set Ti | to the | mean int | ernal te | mperatu | re obtair | ned | at ste | ep 11 of | Tabl | e 9b, | so that | t Ti,m= | (76)m an | d re-calo | culate | |
| the uti | lisation | 1 | | using Ta | able 9a | | | | | | | | | | 1 | |
| L | Jan | Feb | Mar | Apr | May | | Jun | Jul | A | ug | Sep | Oct | Nov | Dec | | |
| г | | tor for g | · · · · · · | 1 | | | | 0.40 | | | | | | | 1 | (04) |
| (94)m= | 1 | 1 | 0.99 | 0.96 | 0.84 | |).61 | 0.43 | 0.4 | 9 | 0.81 | 0.98 | 1 | 1 | | (94) |
| (95)m= | 530.85 | 593.68 | , VV = (9 664.03 | 4)m x (8 729.43 | 695.29 | 40 | 99.36 | 334.62 | 349 | 27 5 | 512.39 | 543.89 | 509.39 | 504.76 | 1 | (95) |
| L | | | | perature | | | | 007.02 | J | <u> </u> | | 0-10.09 | 000.00 | 007.70 | l | (00) |
| (96)m= | 4.3 | 4.9 | 6.5 | 8.9 | 11.7 | 1 | 4.6 | 16.6 | 16. | .4 | 14.1 | 10.6 | 7.1 | 4.2 | | (96) |
| L | | | | al tempe | | | | | | | | | 1 | I | I | |
| | | 1335.95 | r | r | 765.86 | <u> </u> | , 505 | 335.01 | 350 | <u> </u> | 550.21 | 837.63 | 1120.98 | 1364.59 | | (97) |
| L | | Į | ! | ! | <u>I</u> | | | | | | | | | I | 1 | |

| Space neatil | ig require | | r each n | nonth, K | wn/mon | tn = 0.02 | 24 x [(97 |)m – (95 | <u>)mj x (4</u> | r)m | | | |
|--------------------------------|------------|-----------------|-----------------|----------------|-----------|-----------|---------------------------------|----------------|-----------------------|---------------------------------|------------|-----------|--------|
| (98)m= 635.39 | 498.81 | 403.96 | 191.36 | 52.5 | 0 | 0 | 0 | 0 | 218.54 | 440.35 | 639.71 | | _ |
| | | | | | | | Tota | l per year | (kWh/year |) = Sum(9 | 8)15,912 = | 3080.61 | (98) |
| Space heating | ng require | ement in | ı kWh/m² | ²/year | | | | | | | | 26.2 | (99) |
| 9a. Energy re | quiremer | nts – Ind | ividual h | eating s | ystems i | ncluding | g micro-C | CHP) | | | | | |
| Space heati | - | t from o | aaandar | v/ounnio | monton | ovetem | | | | | | | |
| Fraction of s | | | | | ementary | • | (202) = 1 · | _ (201) _ | | | | 0 | (201) |
| Fraction of s | | | - | | | | $(202) = 1^{-1}$ (204) = (2) | | (203)] - | | | 1 | (202) |
| Efficiency of | | 0 | | | | | (204) = (2 | 02) ~ [1 | (200)] = | | | 1 | (204) |
| Efficiency of | | | | | a system | n % | | | | | | 93.7 0 | (208) |
| | 1 | · · · | | I | | <u> </u> | <u> </u> | San | Oct | Nov | Dee | 1 | |
| Jan Space heatir | Feb | Mar ement (c | Apr alculate | May d above | Jun | Jul | Aug | Sep | Oct | Nov | Dec | kWh/ye | ar |
| 635.39 | 498.81 | 403.96 | 191.36 | 52.5 | 0 | 0 | 0 | 0 | 218.54 | 440.35 | 639.71 | | |
| (211)m = {[(98 | 3)m x (20 |)4)]}x1 | 1 00 ÷ (20 |)6) | 1 | 1 | <u> </u> | | | | |] | (211) |
| 678.11 | 532.35 | 431.12 | 204.23 | 56.03 | 0 | 0 | 0 | 0 | 233.24 | 469.95 | 682.73 | | |
| | | | | | | | Tota | l (kWh/yea | ar) =Sum(2 | 2 11) _{15,1012} | = | 3287.74 | (211) |
| Sp <mark>ace h</mark> eatir | - | | | month | | | | | | | | | |
| $= \{[(98)m \times (2)]$ | T | | <u> </u> | | | | | | | | | | |
| (215)m= 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 Tota | 0 L (kWh/ve | 0 ar) =Sum(2 | 0 | 0 | 0 | (215) |
| Water heatin | a | | | | | | TOTO | | | 10715,1012 | 2 | 0 | |
| Output from v | - | ter (calc | ulated a | bove) | | | | | | | | | |
| | 112.17 | 118.49 | 108.14 | 108.58 | 97.97 | 95.02 | 104.35 | 104.16 | 11 <mark>3.19</mark> | 117.61 | 124.12 | | |
| Efficiency of v | vater hea | ater | | - | | - | | | | | | 87.2 | (216) |
| (217)m= 90.1 | 90.04 | 89.88 | 89.4 | 88.31 | 87.2 | 87.2 | 87.2 | 87.2 | 89.47 | 89.94 | 90.11 | | (217) |
| Fuel for water $(219)m = (64)$ | | | | | | | | | | | | | |
| (219)m = 141.55 | | 131.83 | 120.96 | 122.96 | 112.35 | 108.96 | 119.67 | 119.45 | 126.51 | 130.77 | 137.74 | | |
| | | | | | | | Tota | I = Sum(2 | 19a) ₁₁₂ = | | | 1497.33 | (219) |
| Annual totals | | | | | | | | | k | Wh/year | | kWh/yea | r |
| Space heating | g fuel use | ed, main | system | 1 | | | | | | | | 3287.74 | |
| Water heating | g fuel use | d | | | | | | | | | | 1497.33 | |
| Electricity for | pumps, f | ans and | electric | keep-ho | t | | | | | | | | |
| mechanical | ventilatio | n - balar | nced, ext | ract or p | ositive i | nput fror | n outside | Ð | | | 222.74 | | (230a) |
| central heati | ng pump | : | | | | | | | | | 30 | | (230c) |
| boiler with a | fan-assis | sted flue | | | | | | | | | 45 | | (230e) |
| Total electrici | ty for the | above, | kWh/yea | ır | | | sum | of (230a). | (230g) = | | | 297.74 | (231) |
| Electricity for | lighting | | | | | | | | | | | 483.8 | (232) |
| Electricity ger | nerated b | y PVs | | | | | | | | | | -259.09 | (233) |
| | | | | | | | | | | | | | |

| Total delivered energy for all uses (211)(221) + (2 | 5307.53 (338) | | |
|---|---------------------------------|-------------------------------|---------------------------------|
| 12a. CO2 emissions – Individual heating systems | including micro-CHP | | |
| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
| Space heating (main system 1) | (211) x | 0.216 = | 710.15 (261) |
| Space heating (secondary) | (215) x | 0.519 = | 0 (263) |
| Water heating | (219) x | 0.216 = | 323.42 (264) |
| Space and water heating | (261) + (262) + (263) + (264) = | | 1033.57 (265) |
| Electricity for pumps, fans and electric keep-hot | (231) x | 0.519 = | 154.53 (267) |
| Electricity for lighting | (232) x | 0.519 = | 251.09 (268) |
| Energy saving/generation technologies Item 1 | | 0.519 = | -134.47 (269) |
| Total CO2, kg/year | sum | of (265)(271) = | 1304.73 (272) |
| Dwelling CO2 Emission Rate | (272) |) ÷ (4) = | 11.09 (273) |
| El rating (section 14) | | | 89 (274) |
| | | | |

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 15 July 2021

Property Details: Unit 14 - 3B 6P - Be Green

| Dwelling type: | Flat | |
|--|--------------------------------|------|
| Located in: | England | |
| Region: | South East England | |
| Cross ventilation possible: | Yes | |
| Number of storeys: | 1 | |
| Front of dwelling faces: | South | |
| Overshading: | Average or unknown | |
| Overhangs: | None | |
| Thermal mass parameter: | Indicative Value Medium | |
| Night ventilation: | False | |
| Blinds, curtains, shutters: | None | |
| Ventilation rate during hot weather (ach): | 3 (Windows open half the time) | |
| Overheating Details: | | |
| | | |
| Summer ventilation heat loss coefficient: | 314.34 | (P1) |

| Summer ventuation near 1055 coefficient. | 314.34 | (FI) |
|--|--------|------|
| Transmission heat loss coefficient: | 55.4 | |
| Summer heat loss coefficient: | 369.76 | (P2) |
| | | |

| -(1) | Δr | nai | വശ | с÷. |
|------|----|-----|-----|-----|
| 0. | | nai | IQ. | |
| | | | | |

| Orientation:Ratio:West (West Window)0North (North Window)0North (North Window 2)0East (East Window)East (East Window)0Solar shading:Orientation:Z blinds:West (West Window)1North (North Window)1North (North Window)1North (North Window 2)1 | Z_overhangs: 1 1 1 1 1 1 Solar access: 0.9 0.9 0.9 0.9 0.9 | 1 1 1 | overhangs: | Z summer: 0.9 0.9 0.9 | (P8 (P8 (P8 | 5) 5) |
|--|--|-------------|-----------------|---------------------------------------|--------------------------|----------|
| East (East Window) 1 | 0.9 | 1 | | 0.9 | (P8 | 5) |
| Solar gains: | | | | | | |
| Orientation Ar | ea Flux | g_ | FF | Shading | Gains | |
| West (West Window) 0.9 x 1.2 | 124.8 | 0.63 | 0.7 | 0.9 | 57.06 | |
| North (North Window) 0.9 x 3.8 | 86.66 | 0.63 | 0.7 | 0.9 | 118.87 | |
| North (North Window 2)0.9 x 4.0 | 9 86.66 | 0.63 | 0.7 | 0.9 | 126.61 | |
| East (East Window) 0.9 x 6.7 | 14 124.8 | 0.63 | 0.7 | 0.9 | 273.71 | |
| | | | | Total | 576.25 (P3 | 5/P4) |
| Internal gains: | | | | | | |
| | | | | | | |
| | | | June | July | August | |
| Internal gains | | | 527.61 | 505.78 | 515.69 | |
| Total summer gains | | | 1144.62 | 1082.03 | 1000.58 (P5 | |
| Summer gain/loss ratio | (Cauth Fast Franks | -1) | 3.1 | 2.93 | 2.71 (P6 | 9 |
| Mean summer external temperature | | u) | 15.4 | 17.4 | 17.5 | |
| Thermal mass temperature incremer Threshold temperature | IL | | 0.25 18.75 | 0.25 20.58 | 0.25 20.46 (P7 | n |
| Likelihood of high internal temper | ature | | Not significant | Slight | Not signific | • |

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature:

<u>Slight</u>

