

# Marine Ices, Haverstock Hill, London, NW3 2BL

### **Energy Statement – Retail Scheme**

January 2015

CUTTING THE COST OF CARBON

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# 1 Issue Register

| Revision | Reason for Issue | Date of Issue | Issued By             |
|----------|------------------|---------------|-----------------------|
| 1.0      | For submission   | 16/01/2015    | J Simpson CEng MCIBSE |
|          |                  |               |                       |
|          |                  |               |                       |

### 2 Contents

| 1     | Issue Register  | 3  |
|-------|---|----|
| 2     | Contents  | 4  |
| 3     | Executive Summary   | 5  |
| 4     | Introduction  | 7  |
| 4.1   | Proposed Development  | 7  |
| 4.2   | Planning Policy Context                                     | 7  |
| 4.2.1 | National  | 7  |
| 4.2.2 | Regional  | 7  |
| 4.2.3 | Local   | 9  |
| 5     | Methodology   | 11 |
| 6     | Energy Demand   | 12 |
| 6.1   | Residential   | 12 |
| 6.2   | Commercial  | 13 |
| 7     | Community Heating & CHP                                     | 15 |
| 8     | Renewables – Feasibility Study                              | 16 |
| 9     | Renewables - Detailed Proposal                              | 18 |
| 9.1   | Air Source Heat Pumps                                       |    |
| 9.2   | Photovoltaic Panels   |    |
| 10    | Conclusion  | 19 |
| 11    | Appendix A – Proposed PV Layout                             | 20 |
| 12    | Appendix B – Energy Efficiency DER Worksheets (Part L 2013) | 21 |
| 13    | Appendix C – TER Worksheets (Part L 2013)                   | 22 |
| 14    | Appendix D – BRUKL Report (Efficiency)                      | 23 |
| 15    | Appendix E – BRUKL Report (ASHPs)                           | 24 |

### 3 Executive Summary

This document responds to planning policy in respect of energy consumption and carbon dioxide emissions. The methodology used herein is consistent with the London Renewables Toolkit (LRT) and Part L of the Building Regulations.

The Proposed Development features improved insulation and air tightness standards, when compared against the compliance requirements of Part L 2013 of the Building Regulations. In addition, energy efficient lighting is to be provided throughout the dwellings in excess of the Part L1 2013 requirements.

There are no details of installed district heating schemes in the immediate vicinity of the site, and the Proposed Development is considered to be too small to successfully incorporate a community heating system. It is also considered that the small increase in heating plant efficiency due to the incorporation of a system would be cancelled out by the increase in energy consumption required to pump the heating water circuit.

Combined heat and power (CHP) has been assessed in terms of feasibility. There is no economic or sustainable justification for over-sizing the CHP plant, and therefore the CHP unit size needs to be carefully matched to the demands of the development. The smallest commercially available CHP unit is too large for the scheme due to the limited number of residential dwellings, and therefore CHP is not considered to be viable for the Proposed Development.

A feasibility study of the currently available low and zero carbon technologies has been undertaken, with air source heat pumps proposed for the commercial unit, and photovoltaic panels proposed for the development at roof level to generate electricity for the site. It has been estimated that the proposed air source heat pumps would reduce the annual carbon dioxide emissions of the site by 19,862 kgCO<sub>2</sub>, which equates to a reduction of 23.7% against the TER 2013. It has been estimated that the proposed photovoltaic systems would reduce the annual carbon dioxide emissions of the site by 9,036 kgCO<sub>2</sub>, which equates to a reduction of 10.8% against the TER 2013.

The incorporation of the energy efficiency measures, air source heat pumps and photovoltaic panels equates to a reduction of 44.2% against the TER 2013 for the scheme, which exceeds the local policy requirements.

A summary of the reduction in emissions is shown in Tables 1 and 2 below, and graphically in Figure 1 below, for comparison against London Plan energy policy:

| Stage   | Regulated carbon dioxide<br>emissions (heating, cooling, hot<br>water, lighting, fans & pumps)<br>(kgCO <sub>2</sub> /yr) | Unregulated carbon dioxide<br>emissions (cooking, appliances,<br>communal lighting & power)<br>(kgCO <sub>2</sub> /yr) |
|---|---|--|
| Building Regulations<br>Compliance (TER 2013)   | 83,665  | 73,084   |
| Energy Efficiency<br>Measures ('Be Lean')       | 75,613  | 73,084   |
| Proposed Development<br>with ASHPs ('Be Green') | 55,751  | 73,084   |
| Proposed Development<br>with PVs ('Be Green')   | 46,715  | 73,084   |

Table 1 – Carbon dioxide emissions after each stage of the Energy Hierarchy

| Stage               | Regulated carbon dioxide savings |      |  |  |  |  |  |
|---------------------|----------------------------------|------|--|--|--|--|--|
|                     | (Tonnes CO2 per annum)           | (%)  |  |  |  |  |  |
| Savings from energy | 8,053                            | 9.6  |  |  |  |  |  |
| demand reduction    |                                  |      |  |  |  |  |  |
| Savings from ASHPs  | 19,862                           | 23.7 |  |  |  |  |  |
| Savings from PVs    | 9,036                            | 10.8 |  |  |  |  |  |
| Total Cumulative    | 36,950                           | 44.2 |  |  |  |  |  |
| Savings             |                                  |      |  |  |  |  |  |

Table 2 – Regulated carbon dioxide savings from each stage of the Energy Hierarchy





### 4 Introduction

#### 4.1 Proposed Development

The Proposed Development comprises the redevelopment of the site to provide a retail shell at basement and ground floor level, with 19 new residential apartments above. Cycle and refuse stores are located along the Crogsland Road facade.

#### 4.2 Planning Policy Context

#### 4.2.1 National

The following description is taken from the LRT

"Increased development of renewable energy resources is vital to facilitating the delivery of the Government's commitments on both climate change and renewable energy. The Government's Energy Policy, including its policy on renewable energy, is set out in the Energy White Paper. This aims to put the UK on a path to cut its carbon dioxide emissions by some 60% by 2050, with real progress by 2020, and to maintain reliable and competitive energy supplies. As part of the strategy for achieving these reductions the White Paper sets out:

- The Government's target to generate 10% of UK electricity from renewable energy sources by 2010
- The Government's aspiration to double that figure to 20% by 2020 and suggests that still more renewable energy will be needed beyond that date.

"The Energy White Paper indicated that the Government would be looking to work with regional and local bodies to deliver its objectives, including establishing regional targets for renewable energy generation. Regional Planning Guidance should include the target for renewable energy generation for its respective region, derived from assessments of the region's renewable energy resource potential."

The *National Planning Policy Framework* sets out the Government's national policy for renewable energy. It states that "to help increase the use and supply of renewable and low carbon energy, local planning authorities should recognise the responsibility on all communities to contribute to energy generation from renewable or low carbon sources."

#### 4.2.2 Regional

The London Plan is the overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031. It forms part of the development plan for Greater London. The London Plan 2011 was published on 22 July 2011.

Policy 5.2 (Minimising Carbon Dioxide Emissions) states that:

"Development proposals should make the fullest contribution to minimizing carbon dioxide emissions in accordance with the following energy hierarchy:

- 1 Be lean: use less energy
- 2 Be clean: supply energy efficiently
- 3 Be green: use renewable energy

The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

| Year        | Improvement on 2010 Building Regulations |  |  |  |  |  |  |
|-------------|--|--|--|--|--|--|--|
|             | Residential buildings                    | Non-domestic buildings                   |  |  |  |  |  |
| 2010 – 2013 | 25 per cent                              | 25 per cent                              |  |  |  |  |  |
| 2013 – 2016 | 40 per cent                              | 40 per cent                              |  |  |  |  |  |
| 2016 – 2019 | Zero carbon                              | As per building regulations requirements |  |  |  |  |  |
| 2019 – 2031 |  | Zero carbon                              |  |  |  |  |  |

Table 3 – Proposed carbon dioxide reduction targets under the 2011 London Plan

Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

As a minimum, energy assessments should include the following:

- a) Calculation of the energy demand and carbon dioxide emissions covered by the Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations at each stage of the energy hierarchy
- b) Proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services
- c) Proposals to further reduce carbon dioxide emissions through the use of decentralized energy where feasible, such as district heating and cooling and combined heat and power (CHP)
- d) Proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies."

Policy 5.7 (Renewable Energy) states that:

"The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London.

Within the framework of the energy hierarchy, major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible."

Following the update to Part L of the Building Regulations in April 2014, the carbon dioxide reduction targets have been revised to reflect the changes in software and Building Regulations compliance targets. The GLA have confirmed in their policy update that the current requirement is for a 35% reduction in carbon dioxide emissions against the Part L 2013 TER requirements.

#### 4.2.3 Local

The Core Strategy was adopted by the London Borough of Camden on 8 November 2010, and sets out the key vision for the borough up to 2025.

Policy CS13 states that:

#### "Reducing the effects of and adapting to climate change

The Council will require all development to take measures to minimise the effects of, and adapt to, climate change and encourage all development to meet the highest feasible environmental standards that are financially viable during construction and occupation by:

- a) ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;
- b) promoting the efficient use of land and buildings
- c) minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:
  - 1. ensuring developments use less energy,

2. making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralized energy networks;

3. generating renewable energy on-site; and

d) ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.

The Council will have regard to the cost of installing measures to tackle climate change as well as the cumulative future costs of delaying reductions in carbon dioxide emissions.

#### Local energy generation

The Council will promote local energy generation and networks by:

e) working with our partners and developers to implement local energy networks in the parts of Camden most likely to support them, i.e. in the vicinity of:

 housing estates with community heating or the potential for community heating and other uses with large heating loads;

- the growth areas of King's Cross; Euston; Tottenham Court Road; West Hampstead Interchange and Holborn;

- schools to be redeveloped as part of Building Schools for the Future programme;
- existing or approved combined heat and power/local energy networks (see Map 4);

and other locations where land ownership would facilitate their implementation.

f) protecting existing local energy networks where possible (e.g. at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road)."

Development Policy DP22 on 'Promoting sustainable design and construction' states that:

"The Council will require development to incorporate sustainable design and construction measures. Schemes must:

- a) demonstrate how sustainable development principles, including the relevant measures set out in paragraph 22.5 below, have been incorporated into the design and proposed implementation; and
- b) incorporate green or brown roofs and green walls wherever suitable.

The Council will promote and measure sustainable design and construction by:

- c) expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and encouraging Code Level 6 (zero carbon) by 2016.;
- expecting developments (except new build) of 500 sq m of residential floorspace or above or 5 or more dwellings to achieve "very good" in EcoHomes assessments prior to 2013 and encouraging "excellent" from 2013;
- e) expecting non-domestic developments of 500sqm of floorspace or above to achieve "very good" in BREEAM assessments and "excellent" from 2016 and encouraging zero carbon from 2019.

The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:

- f) summer shading and planting;
- g) limiting run-off;
- h) reducing water consumption;
- i) reducing air pollution; and
- j) not locating vulnerable uses in basements in flood-prone areas."

### 5 Methodology

This report draws on the information and approach set out in the LRT. The currency used for emissions is carbon dioxide, rather than the carbon equivalent, for consistency with Part L of the Building Regulations.

A Part L analysis is conducted to calculate carbon dioxide emissions for the following end uses: heating; hot water; cooling; fans, pumps and controls; and lighting. Various energy-saving measures are considered in terms of technical and economic feasibility and their effect on carbon dioxide emissions. A package of energy-saving measures is proposed that meets the Part L standard, without reliance on the contribution of CHP or renewables. Unregulated energy end uses, such as appliances, are added using the SBEM or SAP software.

CHP is then considered in terms of technical and economic feasibility and its effect on carbon dioxide emissions. The strategic issues relating to each technology are also considered in the context of the Proposed Development, and two or three preferred options are short-listed. These are then considered in more detail in terms of technical and economic feasibility and its effect on carbon dioxide emissions.

Calculations are presented in summary form in subsequent sections, with detailed calculations in Appendix A.

| Step 1 | ENERGYAUDIT                   | Modelling the Proposed Development to achieve compliance<br>with Part L of the Building Regulation. Include energy<br>consumption from communal areas, cooking and appliances. |
|--------|-------------------------------|--|
| Step 2 | ENERGY SAVING                 | Improving U-values (windows, roof, wall, floors), and air tightness.<br>Include efficient heating, and hot water systems, and efficient<br>lighting systems.                   |
| Step 3 | CENTRALISED<br>HEATING SYSTEM | Include community heating systems as they offer potential economies of scale in respect of efficiency, and greater opportunities for incorporation of renewables energy.       |
| Step 4 | COMBINED HEAT<br>AND POWER    | Investigate use of combined heat and power (CHP)   |
| Step 5 | RENEWABLE<br>ENERGY           | Undertake feasibility study to short list renewable options.<br>Detailed Proposal with selected renewable energy source(s).  |

Figure 2 below provides a summary of the methodology in the form of a flow diagram.

Figure 2 – Flow diagram of methodology

# 6 Energy Demand

#### 6.1 Residential

The Development would feature energy saving measures such that compliance with Part L of the Building Regulations (2013) would be achieved without reliance on the contribution of CHP or renewable technologies.

As required under Part L, the residential units have been assessed under Part L1A, with SAP calculations undertaken using the Part L1A 2013 methodology.

The minimum requirements for compliance with Part L1A 2013 were established, and feasible improvements were included to further reduce the carbon dioxide emissions. The measures outlined below have been used in the Part L1A calculations, and exceed the requirements of Part L1A. The proposed fabric performance is compared against the Part L1A 2013 requirements in Table 4 below:

| Element                      | Proposed Development   | Part L1A 2013 Requirements |
|------------------------------|--|----------------------------|
| External wall U-value        | 0.20 W/m².K  | 0.30 W/m².K                |
| Exposed roof U-value         | 0.15 W/m².K  | 0.20 W/m².K                |
| Exposed floor U-value        | 0.15 W/m².K  | 0.25 W/m².K                |
| Window & glazed door U-value | 1.40 W/m².K  | 2.00 W/m².K                |
| Solid door U-value           | 1.10 W/m².K  | 2.00 W/m².K                |
| Party wall U-value           | 0.00 W/m <sup>2</sup> .K (equivalent U-<br>value with fully-filled party<br>walls) | 0.20 W/m².K                |
| Air permeability             | 3 m³/hr/m² @ 50 Pa (with tests<br>undertaken in each dwelling)                     | 10 m³/hr/m² @ 50 Pa        |
| Thermal bridging             | Accredited Construction Details to be used throughout                              | 0.15                       |
| Low energy lighting          | 100%   | 75%                        |

Table 4 – Comparison of proposed residential performance

High efficiency condensing gas-fired boilers are proposed for each dwelling. Ideal Code Combi boilers are proposed for the single bathroom apartments, with a system boiler and hot water cylinder for dwellings with two bathrooms. It has been assumed that underfloor heating is provided to each dwelling, with design flow temperature between 35 and 45°C. Time and temperature zone control would be provided for each dwelling.

Mechanical ventilation systems with heat recovery are proposed for each dwelling, in order to recover extracted heat from bathrooms and kitchens and reuse this for fresh air supply into habitable rooms. This also enables the external grille locations for fresh air intake and exhaust to be positioned sympathetically on the external facades, eliminates the requirement for trickle vents above windows and enables high levels of air tightness to be achieved.



Figure 3 - Typical MVHR installations

#### 6.2 Commercial

The Development would feature energy saving measures such that compliance with Part L of the Building Regulations (2013) would be achieved without reliance on the contribution of CHP or renewable technologies.

As required under Part L, the commercial element of the scheme has been assessed under Part L2A, with SBEM calculations undertaken using Part L2A 2013 methodology.

The minimum requirements for compliance with Part L2A 2013 were established, and feasible improvements were included to further reduce the carbon dioxide emissions. The measures outlined below have been used in the Part L2A calculations, and exceed the requirements of Part L2A. The proposed fabric performance is compared against the Part L2A 2013 requirements in Table 5 below:

| Element                       | Proposed Development | Part L1A 2013 Requirements |
|-------------------------------|----------------------|----------------------------|
| External wall U-value         | 0.20 W/m².K          | 0.30 W/m².K                |
| Exposed roof U-value          | 0.15 W/m².K          | 0.20 W/m².K                |
| Basement/ground floor U-value | 0.15 W/m².K          | 0.25 W/m².K                |
| Window & glazed door U-value  | 1.60 W/m².K          | 2.00 W/m².K                |
| Solid door U-value            | 1.80 W/m².K          | 2.00 W/m².K                |
| Air permeability              | 5 m³/hr/m² @ 50 Pa   | 10 m³/hr/m² @ 50 Pa        |

Table 5 – Comparison of proposed residential performance

The retail element of the scheme would be constructed as a shell, with the future fit-out to be undertaken by the retail tenant. As such, reasonable assumptions have been made within the Energy Strategy for the heating, ventilation, air conditioning and lighting systems, with the following included:

- Heating and cooling by fan coil units to all areas to provide heating and comfort cooling;
- Mechanical supply and extract ventilation with heat recovery via plate heat exchanger, and system specific fan power of 1.5 W/l/s;
- Lighting efficacy of 85 lumens per circuit Watt, and display lighting efficacy of 65 lumens per circuit Watt;
- Local electric point-of-use water heaters (due to limited hot water demand).

These design parameters have been used to demonstrate that the future fit-out could achieve a 6.2% improvement against Part L 2013, without any reliance on renewable technology.

# 7 Community Heating & CHP

The Mayor's Energy Strategy favours community heating systems because they offer:

- Potential economies of scale in respect of efficiency and therefore reduced carbon emissions; and
- Greater potential for future replacement with Low or Zero Carbon (LZC) technologies.

There are no existing district heating systems in the immediate vicinity of the site, and therefore not considered to be feasible to connect to a district heating system. The Proposed Development is considered to be too small to successfully incorporate a community heating system, with typically 60 dwellings being the minimum to provide an economically feasible centralized system which also provides a reduction in carbon dioxide emissions. It is also considered that the small increase in heating plant efficiency due to the incorporation of a system of the limited size that this particular scheme would require would be cancelled out by the increase in energy consumption required to pump the heating water circuit.

Combined heat and power (CHP) has been assessed in terms of feasibility. There is no economic or sustainable justification for over-sizing the CHP plant, and therefore the CHP unit size needs to be carefully matched to the demands of the development. The Proposed Development is not large enough to contain a district wide CHP system to serve surrounding buildings and future schemes, and the smallest commercially available CHP unit is too large for the scheme due to the limited number of residential dwellings. CHP systems are usually specified for large schemes with more than 100-150 dwellings due to the need to have a large enough heat demand to supply from the CHP system – the smallest commercially available CHP unit (the Baxi DACHS micro-CHP unit) would supply 60 dwellings, and therefore would not be economically or technically feasible for this scheme. Therefore CHP is not considered to be viable for the Proposed Development.

### 8 Renewables – Feasibility Study

The LRT provides benchmark sizing and cost data for "renewable energy technologies suitable for London". It therefore provides information to assess the various technologies at an early design stage, with initial measurements of the impact of using each technology on the building's carbon dioxide emissions. Table 6 (below) outlines these technologies and the variations proposed in the LRT used in this assessment.

| Technology                    | End Use Demand Met  |
|-------------------------------|---|
| Wind                          | Electricity   |
| PV Cells - rooftop            | Electricity   |
| PV Cells - cladding           | Electricity   |
| Solar Water Heating           | Annual DHW (50 %)   |
| Biomass heating (a)           | Annual Space Heating +Domestic Hot Water (33%)                                |
| Biomass heating (b)           | Annual Space Heating +Domestic Hot Water (50%)                                |
| Biomass heating (c)           | Annual Space Heating +Domestic Hot Water (100%)                               |
| Biomass CHP (a)               | Annual Space Heating +Domestic Hot Water (33%)                                |
| Biomass CHP (b)               | Annual Space Heating +Domestic Hot Water (50%)                                |
| Ground sourced heat pumps (a) | Annual Space Heating +Domestic Hot Water (50%)                                |
| Ground sourced heat pumps (b) | Annual Space Heating +Domestic Hot Water (100%)                               |
| Ground sourced heat pumps (c) | Peak Space Heating (50 %) Annual Space Heating + Domestic Hot<br>Water (85 %) |
| Ground cooling (a)            | Annual Cooling (50%)  |
| Ground cooling (b)            | Annual Cooling (100%)   |

Table 6 – Renewable energy technologies suitable for London

The following other "acceptable renewable energy technologies" are considered to be not typically appropriate in London:

- Fuel cells using hydrogen from renewable sources;
- Gas from anaerobic digestion;
- Geothermal;
- Ground cooling air systems;
- Micro hydro; and
- Solar air collectors.

On the basis of this preliminary analysis, and a review of the general advantages and disadvantages of the different technologies relative to the Proposed Development, the following technologies were not considered to be appropriate to the Proposed Development:

- Wind turbines: on the basis of visual appearance, noise issues and concerns over outputs in urban areas. Wind turbines are not considered appropriate for the urban context. There are still concerns over noise with the horizontal axis turbines, and therefore they are not considered appropriate for the development. The average wind speed for the Proposed Development is noted on the Encraft website as 4.7m/s at 10m this is significantly below the required average wind speed to make wind turbines a practical solution, particularly when the power output of the turbines is reduced by 7/8ths when the wind speed is halved;
- **Biomass:** on the basis of concerns over air quality issues from flue discharge; concerns over transport issues relating to regular deliveries of biomass; security and cost of fuel supply; concerns over disposal of ash; and relatively high maintenance. Biomass is not considered to be a suitable fuel for use within an urban development, and therefore this technology is not considered appropriate for the development. Deliveries of biomass pellets is undertaken by large vehicles the equivalent size of domestic oil delivery tankers and it is not considered appropriate to have vehicles of this size navigating the local streets and making regular deliveries to the site;
- **Biomass CHP:** on the basis of embodied impacts; high maintenance; concerns over air quality issues from flue discharge; concerns over transport issues relating to regular deliveries of biomass; lack of micro-scale units on the market to suit this scale of development; and it being an immature technology. Biomass is not considered to be a suitable fuel for use within an urban development, therefore this technology is not considered appropriate for the development. A large biomass fuelled CHP with heat output of 200 kW is available, but this is approximately 4 times larger than required for this scheme, particularly as the current biomass fuelled CHP units need to operate 24/7 biomass CHP is therefore not considered to be feasible for this scheme;
- **Solar thermal:** due to changes in the Building Regulations calculations, the incorporation of photovoltaic panels provide a greater percentage reduction in carbon dioxide than a solar thermal system, and therefore the proposed strategy of photovoltaic panels is considered to be the most appropriate solution; and
- **Ground source:** due to the limited site area at ground level, there is insufficient area available for horizontal loops. The use of open loop boreholes has been discounted as there is a risk of drilling and not finding a suitable aquifer. The use of closed loop boreholes has been discounted because there is insufficient site area to contain the required number. The resultant carbon footprint of the residential element of the scheme with gas boilers and photovoltaic panels is significantly lower than that using ground source or air source heat pumps, and therefore the proposed strategy is considered to be the most appropriate solution. Air source heat pumps are considered to be more appropriate for the commercial element of the scheme than ground source, with only a small decrease in efficiency but a significant reduction in capital cost.

### 9 Renewables - Detailed Proposal

On the basis of this preliminary analysis, and a review of the general advantages and disadvantages of the different technologies relative to the Proposed Development, the following technologies were considered to be appropriate to the Proposed Development:

- Air source heat pumps; and
- Photovoltaic panels.

#### 9.1 Air Source Heat Pumps

It is proposed that air source heat pumps are installed within the ground floor plantroom for the retail unit, to provide heating and cooling to the scheme. This would increase the efficiency of the heating and cooling systems for the development, and would reduce the annual carbon dioxide emissions of the Proposed Development by 19,862 kgCO<sub>2</sub> – this equates to a reduction of 23.7% against the regulated emissions (2013).

#### 9.2 Photovoltaic Panels

Photovoltaic panels extract the energy of the sun to generate electricity. It is proposed that photovoltaic panels be installed on the roofs, to generate electricity for the development. These electrical generation systems would be connected to the National Grid so that any surplus electricity can be exported to the Grid, and would be eligible for the feed-in tariffs.

It has been estimated that a total photovoltaic area of 100.8 m<sup>2</sup> can be installed at roof level, facing due south at an elevation of 15°, to provide a total annual output of 16,870 kWh. This equates to a system size of 9.60 kWp to be connected to the residential Landlord systems, and a system size of 10.56 kWp to be connected to the retail unit at ground and basement level.

The incorporation of the photovoltaic cells within the scheme would reduce the annual carbon dioxide emissions of the Proposed Development by 9,036 kgCO<sub>2</sub>, which equates to a reduction of 10.8% against the regulated emissions (2013). A proposed layout is attached in Appendix A, which would be reviewed during the detailed design stage to reflect changes in available products and prices.



Figure 4 - Typical photovoltaic panel installations

### 10 Conclusion

This document responds to planning policy in respect of energy consumption and carbon dioxide emissions. The methodology used herein is consistent with the London Renewables Toolkit (LRT) and Part L of the Building Regulations.

The Proposed Development features improved insulation and air tightness standards, when compared against the compliance requirements of Part L 2013 of the Building Regulations. In addition, energy efficient lighting is to be provided throughout the dwellings in excess of the Part L1 2013 requirements.

There are no details of installed district heating schemes in the immediate vicinity of the site, and the Proposed Development is considered to be too small to successfully incorporate a community heating system. It is also considered that the small increase in heating plant efficiency due to the incorporation of a system would be cancelled out by the increase in energy consumption required to pump the heating water circuit.

CHP has been assessed in terms of feasibility. There is no economic or sustainable justification for over-sizing the CHP plant, and therefore the CHP unit size needs to be carefully matched to the demands of the development. The smallest commercially available CHP unit is too large for the scheme due to the limited number of residential dwellings, and therefore CHP is not considered to be viable for the Proposed Development.

A feasibility study of the currently available low and zero carbon technologies has been undertaken, with air source heat pumps proposed for the commercial unit, and photovoltaic panels proposed for the development at roof level to generate electricity for the site. It has been estimated that the proposed air source heat pumps would reduce the annual carbon dioxide emissions of the site by 19,862 kgCO<sub>2</sub>, which equates to a reduction of 23.7% against the TER 2013. It has been estimated that the proposed photovoltaic systems would reduce the annual carbon dioxide emissions of the site by 9,036 kgCO<sub>2</sub>, which equates to a reduction of 10.8% against the TER 2013.

The incorporation of the energy efficiency measures, air source heat pumps and photovoltaic panels equates to a reduction of 44.2% against the TER 2013 for the scheme, which exceeds the local policy requirements.

### 11 Appendix A – Proposed PV Layout

The attached roof plan shows the currently proposed photovoltaic panel layout for scheme – these are preliminary layouts and are subject to revisions in the event of changes in standard panel sizes and outputs.





|   | Client<br>LRP<br>Project<br>Marine Ices<br>Haverstock Hill, London, NW3 2BL | Architecture Ltd              | Twenty First Archi<br>314 Goswell Road,<br>London,<br>EC1V 7AF<br>Tel: +44(0)20 79<br>www.21starchitectu | tecture Ltd,<br>52 0252<br>ure.com |
|---|---|-------------------------------|--|------------------------------------|
|   | Drawing Title<br>Proposed Roof Plan   | Status<br>Planning            | Drawn<br>JSP   | Checked<br>TJS                     |
| _ | General Arrangement   | Scale<br>1:100 @ A1 1:200 @ A | \3   | Date<br>Aug 2014                   |
|   |   | Drwg. No.<br>177_GA_05        |  | Revision<br>C                      |

### 12 Appendix B – Energy Efficiency DER Worksheets (Part L 2013)

The following DER Worksheets are taken from the SAP 2012 software for a sample of the modelled dwellings in accordance with current London Plan policy – these are following inclusion of the energy efficiency measures, but before inclusion of the photovoltaic systems proposed.

The following dwellings are included as a sample – worksheets for all dwellings can be provided upon request:

1.01

1.02

2.04

2.05

3.05

4.01

4.02

### DER Worksheet Design - Draft



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

| Assessor name           |           | Mr John       | Mr John Simpson |               |               |               |               |           |                             | Assessor number |            |                   | 3722  |  |
|-------------------------|-----------|---------------|-----------------|---------------|---------------|---------------|---------------|-----------|-----------------------------|-----------------|------------|-------------------|-------|--|
| Client                  |           |               |                 |               |               |               |               |           | Last modified               | 19/11           | 19/11/2014 |                   |       |  |
| Address                 |           | Unit 1.01     | . Marine Ice    | es Haversto   | ock Hill, Lor | ndon, NW3     | 2BL           |           |                             |                 |            |                   |       |  |
|                         |           |               |                 |               |               |               |               |           |                             |                 |            |                   |       |  |
| 1. Overall dwelling     | dimens    | ions          |                 |               |               |               |               |           |                             |                 |            |                   |       |  |
|                         |           |               |                 |               | Α             | area (m²)     |               | Av        | verage storey<br>height (m) | 1               | Vo         | lume (m³)         |       |  |
| Lowest occupied         |           |               |                 |               |               | 70.20         | (1a) x        |           | 2.60                        | (2a) =          |            | 182.52            | (3a)  |  |
| Total floor area        |           | (1a)          | + (1b) + (1e    | c) + (1d)(    | 1n) =         | 70.20         | (4)           |           |                             |                 |            |                   |       |  |
| Dwelling volume         |           |               |                 |               |               |               |               | (3        | 3a) + (3b) + (3             | 3c) + (3d)(3    | n) =       | 182.52            | (5)   |  |
| 2. Ventilation rate     |           |               |                 |               |               |               |               |           |                             |                 |            |                   |       |  |
|                         |           |               |                 |               |               |               |               |           |                             |                 | m³         | per hour          |       |  |
| Number of chimneys      | 5         |               |                 |               |               |               |               |           | 0                           | x 40 =          |            | 0                 | (6a)  |  |
| Number of open flue     | es        |               |                 |               |               |               |               |           | 0                           | <br>x 20 =      |            | 0                 | (6b)  |  |
| Number of intermitte    | ent fans  | 5             |                 |               |               |               |               |           | 0                           | <br>x 10 =      |            | 0                 | (7a)  |  |
| Number of passive v     | ents      |               |                 |               |               |               |               |           | 0                           | <br>x 10 =      |            | 0                 | (7b)  |  |
| Number of flueless g    | as fires  |               |                 |               |               |               |               |           | 0                           | <br>x 40 =      |            | 0                 | (7c)  |  |
|                         |           |               |                 |               |               |               |               |           |                             | _               | Air o      | hanges pe<br>hour | r     |  |
| Infiltration due to ch  | imneys,   | , flues, fans | s, PSVs         |               | (6a)          | ) + (6b) + (7 | a) + (7b) + ( | (7c) =    | 0                           | ÷ (5) =         |            | 0.00              | (8)   |  |
| If a pressurisation te  | st has b  | een carried   | d out or is ii  | ntended, p    | roceed to (   | 17), otherw   | vise continu  | e from (9 | ) to (16)                   | _               |            |                   |       |  |
| Air permeability valu   | ie, q50,  | expressed     | in cubic me     | etres per h   | our per squ   | uare metre    | of envelop    | e area    |                             |                 |            | 3.00              | (17)  |  |
| If based on air perme   | eability  | value, ther   | n (18) = [(17   | 7) ÷ 20] + (8 | 3), otherwi   | se (18) = (1  | 6)            |           |                             |                 |            | 0.15              | (18)  |  |
| Number of sides on v    | which th  | ne dwelling   | g is sheltere   | d             |               |               |               |           |                             |                 |            | 2                 | (19)  |  |
| Shelter factor          |           |               |                 |               |               |               |               |           | 1                           | - [0.075 x (19  | 9)] =      | 0.85              | (20)  |  |
| Infiltration rate incom | rporatin  | g shelter fa  | actor           |               |               |               |               |           |                             | (18) x (2       | .0) =      | 0.13              | (21)  |  |
| Infiltration rate mod   | ified for | monthly w     | wind speed      | :             |               |               |               |           |                             |                 |            |                   |       |  |
|                         | Jan       | Feb           | Mar             | Apr           | May           | Jun           | Jul           | Aug       | Sep                         | Oct             | Nov        | Dec               |       |  |
| Monthly average wir     | nd spee   | d from Tab    | le U2           |               |               |               |               |           |                             |                 |            |                   |       |  |
|                         | 5.10      | 5.00          | 4.90            | 4.40          | 4.30          | 3.80          | 3.80          | 3.70      | 4.00                        | 4.30            | 4.50       | 4.70              | (22)  |  |
| Wind factor (22)m ÷     | 4         |               |                 |               |               |               |               |           |                             |                 |            |                   |       |  |
|                         | 1.28      | 1.25          | 1.23            | 1.10          | 1.08          | 0.95          | 0.95          | 0.93      | 1.00                        | 1.08            | 1.13       | 1.18              | (22a) |  |
| Adjusted infiltration   | rate (al  | lowing for    | shelter and     | wind facto    | or) (21) x (2 | 22a)m         |               |           |                             |                 |            |                   | _     |  |
| (                       | 0.16      | 0.16          | 0.16            | 0.14          | 0.14          | 0.12          | 0.12          | 0.12      | 0.13                        | 0.14            | 0.14       | 0.15              | (22b) |  |
| Calculate effective ai  | ir chang  | e rate for t  | the applical    | ble case:     |               |               |               |           |                             |                 |            |                   | _     |  |
| If mechanical ven       | itilation | : air chang   | e rate throu    | ugh system    |               |               |               |           |                             |                 |            | 0.50              | (23a) |  |
| If balanced with h      | neat rec  | overy: effi   | ciency in %     | allowing fo   | or in-use fa  | ctor from T   | Table 4h      |           |                             |                 |            | 79.90             | (23c) |  |
| a) If balanced me       | chanica   | l ventilatio  | on with hea     | t recovery    | (MVHR) (2     | 2b)m + (23    | b) x [1 - (23 | c) ÷ 100] |                             |                 |            |                   | _     |  |
| (                       | 0.26      | 0.26          | 0.26            | 0.24          | 0.24          | 0.22          | 0.22          | 0.22      | 0.23                        | 0.24            | 0.24       | 0.25              | (24a) |  |
| Effective air change i  | rate - er | nter (24a) o  | or (24b) or (   | (24c) or (24  | ld) in (25)   |               |               | 1         |                             | ·               |            |                   | -     |  |
| (                       | 0.26      | 0.26          | 0.26            | 0.24          | 0.24          | 0.22          | 0.22          | 0.22      | 0.23                        | 0.24            | 0.24       | 0.25              | (25)  |  |



| 3. Heat losses a   | and heat lo          | ss paramet              | ter           |                               |                            |             |              |                  |             |             |                  |              |                  |
|--------------------|----------------------|-------------------------|---------------|-------------------------------|----------------------------|-------------|--------------|------------------|-------------|-------------|------------------|--------------|------------------|
| Element            |                      |                         | a             | Gross<br>irea, m <sup>2</sup> | Openings<br>m <sup>2</sup> | Net<br>A,   | area<br>m²   | U-value<br>W/m²K | A x U V     | V/К к-<br>k | value,<br>J/m².K | Ахк,<br>kJ/K |                  |
| Window             |                      |                         |               |                               |                            | 19          | 9.48 x       | 1.33             | = 25.8      | 3           |                  |              | (27)             |
| Door               |                      |                         |               |                               |                            | 2           | .14 x        | 1.10             | = 2.35      | 5           |                  |              | (26)             |
| Exposed floor      |                      |                         |               |                               |                            | 70          | ).20 x       | 0.10             | = 7.02      | 2           |                  |              | (28b             |
| External wall      |                      |                         |               |                               |                            | 45          | 5.95 x       | 0.20             | = 9.19      | )           |                  |              | (29a)            |
| Party wall         |                      |                         |               |                               |                            | 32          | 2.68 x       | 0.00             | = 0.00      | )           |                  |              | (32)             |
| Total area of ext  | ernal elem           | ents ∑A, m <sup>2</sup> | 2             |                               |                            | 13          | 7.77         |                  |             |             |                  |              | (31)             |
| Fabric heat loss,  | W/K = ∑(A            | × U)                    |               |                               |                            |             |              |                  | (2          | 26)(30) +   | (32) =           | 44.39        | (33)             |
| Heat capacity Cr   | n = ∑(А x к)         | )                       |               |                               |                            |             |              | (28)             | (30) + (32) | + (32a)(3   | 32e) =           | N/A          | (34)             |
| Thermal mass pa    | arameter (1          | ГМР) in kJ/r            | m²K           |                               |                            |             |              |                  |             |             |                  | 250.00       | (35)             |
| Thermal bridges    | : <u>Σ</u> (L x Ψ) с | alculated u             | sing Appen    | dix K                         |                            |             |              |                  |             |             |                  | 11.06        | (36)             |
| Total fabric heat  | loss                 |                         |               |                               |                            |             |              |                  |             | (33) +      | (36) =           | 55.45        | (37)             |
|                    | Jan                  | Feb                     | Mar           | Apr                           | May                        | Jun         | Jul          | Aug              | Sep         | Oct         | Nov              | Dec          |                  |
| Ventilation heat   | loss calcula         | ated month              | nly 0.33 x (2 | 25)m x (5)                    |                            |             |              |                  |             |             |                  |              |                  |
|                    | 15.84                | 15.65                   | 15.46         | 14.50                         | 14.31                      | 13.35       | 13.35        | 13.16            | 13.73       | 14.31       | 14.69            | 15.08        | (38)             |
| Heat transfer co   | efficient, W         | V/K (37)m -             | + (38)m       |                               |                            |             |              |                  |             |             |                  |              |                  |
|                    | 71.30                | 71.11                   | 70.91         | 69.95                         | 69.76                      | 68.80       | 68.80        | 68.61            | 69.19       | 69.76       | 70.15            | 70.53        | ]                |
|                    |                      |                         |               |                               |                            |             |              |                  | Average =   | ∑(39)112    | 2/12 =           | 69.91        | (39)             |
| Heat loss param    | eter (HLP),          | W/m²K (39               | 9)m ÷ (4)     |                               |                            |             |              |                  |             |             |                  |              |                  |
|                    | 1.02                 | 1.01                    | 1.01          | 1.00                          | 0.99                       | 0.98        | 0.98         | 0.98             | 0.99        | 0.99        | 1.00             | 1.00         |                  |
|                    |                      |                         |               |                               |                            |             |              |                  | Average =   | ∑(40)112    | 2/12 =           | 1.00         | (40)             |
| Number of days     | in month (           | Table 1a)               |               |                               |                            |             |              |                  |             |             |                  |              |                  |
|                    | 31.00                | 28.00                   | 31.00         | 30.00                         | 31.00                      | 30.00       | 31.00        | 31.00            | 30.00       | 31.00       | 30.00            | 31.00        | (40)             |
| 1 Water beating    |                      | oquiromon               | .+            |                               |                            |             |              |                  |             |             |                  |              |                  |
| Assumed essues     |                      | equiremen               |               |                               |                            |             |              |                  |             |             |                  | 2.25         |                  |
| Assumed occupa     | hot wator i          | ucago in litr           | os por dav    | Vd avorage                    | ) – (25 v NI) +            | 26          |              |                  |             |             |                  | 2.25         | _ (42)<br>_ (42) |
| Annual average     | lan                  | Feh                     | Mar           | Δnr                           | - (23 X N) +<br>Mav        | lun         | Int          | Διισ             | Sen         | Oct         | Nov              | Dec          | _ (43)           |
| Hot water usage    | in litres ne         | er day for e            | ach month     | Vd m = fac                    | tor from Tab               | le 1c x (43 | 3)           | Aug.             | Sch         | 000         |                  | Dee          |                  |
| not water usuge    | 96.43                | 92 92                   | 89.41         | 85.91                         | 82.40                      | 78.89       | 78.89        | 82.40            | 85.91       | 89.41       | 92.92            | 96.43        | ٦                |
|                    | 50.45                | 52.52                   | 05.41         | 05.51                         | 02.40                      | 70.05       | 70.05        | 02.40            | 05.51       | 5(11)1      | 12 =             | 1051 93      |                  |
| Energy content (   | of hot wate          | er used = 4.1           | 18 x Vd.m x   | nm x Tm/                      | 3600 kWh/m                 | onth (see   | Tables 1b    | . 1c 1d)         |             | 2(++)1.     |                  | 1051.55      | (++)             |
| 2.1.0.87 00110111  | 143.00               | 125.07                  | 129.06        | 112.52                        | 107.96                     | 93.16       | 86.33        | 99.06            | 100.25      | 116.83      | 127.53           | 138,49       | ٦                |
|                    |                      | 1 120107                | 110100        | 1                             | 1 201100                   | 50.10       | 00.00        |                  | 100.20      | Σ(45)1.     |                  | 1379.24      | _<br>│(45)       |
| Distribution loss  | 0.15 x (45           | )m                      |               |                               |                            |             |              |                  |             | 2(.0)2      |                  | 1070121      | ](::)            |
|                    | 21.45                | 18.76                   | 19.36         | 16.88                         | 16.19                      | 13.97       | 12.95        | 14.86            | 15.04       | 17.52       | 19.13            | 20.77        | (46)             |
| Water storage lo   | ss calculat          | ed for each             | month (5!     | 5) x (41)m                    |                            |             |              | 1                |             |             | 1                |              | _ · ·            |
| -                  | 0.00                 | 0.00                    | 0.00          | 0.00                          | 0.00                       | 0.00        | 0.00         | 0.00             | 0.00        | 0.00        | 0.00             | 0.00         | (56)             |
| If the vessel con  | tains dedic          | ated solar s            | torage or c   | ledicated V                   | VWHRS (56)r                | n x [(47) - | · Vs] ÷ (47) | , else (56)      |             |             |                  |              | _, , <u>,</u>    |
|                    | 0.00                 | 0.00                    | 0.00          | 0.00                          | 0.00                       | 0.00        | 0.00         | 0.00             | 0.00        | 0.00        | 0.00             | 0.00         | (57)             |
| Primary circuit lo | oss for each         | n month fro             | m Table 3     |                               |                            |             | 1            | ł                | ł           | 1           | -                | -            | _ · ·            |
|                    | 0.00                 | 0.00                    | 0.00          | 0.00                          | 0.00                       | 0.00        | 0.00         | 0.00             | 0.00        | 0.00        | 0.00             | 0.00         | (59)             |
| Combi loss for e   | ach month            | from Table              | 3a, 3b or 3   | Bc                            | · · ·                      |             |              |                  | -           |             |                  |              | *                |
|                    | 26.88                | 24.28                   | 26.88         | 26.01                         | 26.88                      | 26.01       | 26.88        | 26.88            | 26.01       | 26.88       | 26.01            | 26.88        | (61)             |
| Total heat requi   | red for wat          | er heating              | calculated    | for each me                   | onth 0.85 x (              | 45)m + (4   | l6)m + (57)  | )m + (59)m       | + (61)m     |             |                  | -            |                  |
|                    | 169.88               | 149.35                  | 155.94        | 138.53                        | 134.84                     | 119.18      | 113.21       | 125.94           | 126.26      | 143.71      | 153.54           | 165.37       | (62)             |
|                    |                      |                         |               |                               | •                          |             |              |                  |             |             |                  |              | -                |

| $ \begin{array}{ c c c c c c } \hline 0.00 & 0$ |
|---|
| Injuit (Appendix G1)         6.39 $\overline{5.79}$ $\overline{3.44}$ $\overline{0.87}$ $\overline{0.13}$ $\overline{0.00}$ $\overline{0.00}$ $\overline{0.00}$ $\overline{0.00}$ $\overline{-1.40}$ $\overline{-5.79}$ $\overline{-6.47}$ (63)         Output from water heater for each month (kWh/month) (62)m + (63)m $\overline{163.48}$ $143.55$ $152.50$ $137.66$ $134.71$ $119.18$ $113.21$ $125.94$ $126.26$ $142.31$ $147.75$ $158.90$ $\overline{50.47}$ $\overline{47.65}$ $49.63$ $\overline{43.91}$ $42.62$ $\overline{37.48}$ $\overline{35.42}$ $\overline{39.66}$ $\overline{39.84}$ $\overline{45.57}$ $\overline{48.91}$ $\overline{52.77}$ $\overline{65}$ Staternal gains <b>5. Internal gains Staternal gains Apr May Jun Aug Aug</b>   |
| $ \begin{matrix} -6.39 & -5.79 & -3.44 & -0.87 & -0.13 & 0.00 & 0.00 & 0.00 & -1.40 & -5.79 & -6.47 & (63) \\ \hline Output from water heater for each multiply multiply is the easy of the each multiply is the easy of the e$     |
| Output from water heater for each month (kWh/month) (62)m + (63)m         163.48       143.55       152.50       137.66       134.71       119.18       113.21       125.94       126.26       142.31       147.75       158.90 $\Sigma$ (64)112 =       1665.45       (64)         Heat gains from water heating (kWh/month)       0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]       54.27       47.65       49.63       43.91       42.62       37.48       35.42       39.66       39.84       45.57       48.91       52.77       (65)         State water heating (kWh/month)       0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]         State water heating (kWh/month)       0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]         State water heating (kWh/month)       0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]         State water heating (kWh/month)       0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]         State water heating (kWh/month)       0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]         State water heating (kWh/month)       0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]         State water heating (kWh/month)       0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]         State water hea  |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$   |
| $ \begin{split} & \sum_{\substack{\sum (64)112 = 1665.45 \\ (64)} \\ \text{Heat gains from water heating (kWh/month) } 0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m] \\ \hline \\ & 54.27 & 47.65 & 49.63 & 43.91 & 42.62 & 37.48 & 35.42 & 39.66 & 39.84 & 45.57 & 48.91 & 52.77 & (65) \\ \hline \\ & 5. \text{ Internal gains} \\ \hline \\ & \\ & \\ \hline \\ & \\ & \\ \hline \\ & \\ & \\ \hline \\ & \\ &$   |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Metabolic gains (Table 5)         112.55       1   |
| 54.27       47.65       49.63       43.91       42.62       37.48       35.42       39.66       39.84       45.57       48.91       52.77       (65)         5. Internal gains         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Metabolic gains (Table 5)       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       112.55       166)         Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5       Internal gains       11.47       14.56       17.00       18.12       (67)         Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5       Internal gains       Internal gain   |
| 5. Internal gains         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Metabolic gains (Table 5)       112.55   |
| Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Metabolic gains (Table 5)         112.55         112.55         112.55         112.55         112.55         112.55         112.55         112.55         112.55         112.55         112.55         112.55         112.55         112.55         166           Lighting gains (calculated in Appendix L, equation U or L9a), also see Table 5         117.63         15.66         12.74         9.64         7.21         6.08         6.57         8.55         11.47         14.56         17.00         18.12         (67)           Appliance gains (calculated in Appendix L, equation L13 or L13   |
| Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Metabolic gains (Table 5)         112.55         112.5  |
| Metabolic gains (Table 5)         112.55       <  |
| 112.55         |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5<br>17.63 15.66 12.74 9.64 7.21 6.08 6.57 8.55 11.47 14.56 17.00 18.12 (67)<br>Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5<br>197.76 199.82 194.64 183.63 169.74 156.68 147.95 145.90 151.07 162.08 175.98 189.04 (68)<br>Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5<br>34.25 34.25 34.25 34.25 34.25 34.25 34.25 34.25 34.25 34.25 34.25 34.25 (69)  |
| 17.63       15.66       12.74       9.64       7.21       6.08       6.57       8.55       11.47       14.56       17.00       18.12       (67)         Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5         197.76       199.82       194.64       183.63       169.74       156.68       147.95       145.90       151.07       162.08       175.98       189.04       (68)         Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5         34.25  |
| Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5         197.76       199.82       194.64       183.63       169.74       156.68       147.95       145.90       151.07       162.08       175.98       189.04       (68)         Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5         34.25       34.25       34.25       34.25       34.25       34.25       34.25       34.25       34.25       34.25       34.25       (69)   |
| 197.76       199.82       194.64       183.63       169.74       156.68       147.95       145.90       151.07       162.08       175.98       189.04       (68)         Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5         34.25       34.25       34.25       34.25       34.25       34.25       34.25       34.25       34.25       34.25       34.25       (69)  |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5         34.25  |
| 34.25       |
|   |
| Pump and fan gains (Table 5a)   |
| 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00   |
| Losses e.g. evaporation (Table 5)   |
| -90.04 -90.04 -90.04 -90.04 -90.04 -90.04 -90.04 -90.04 -90.04 -90.04 -90.04 -90.04 (71)  |
| Water heating gains (Table 5)   |
| 72 94 70 91 66 71 60 99 57 28 52 06 47 61 53 30 55 33 61 24 67 92 70 92 (72)  |
| Total internal gains $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$  |
| 348 10 346 15 333 85 314 03 293 99 274 58 261 90 267 51 277 63 297 65 320 66 337 85 (73)  |
| <u>540.10</u> 540.15 555.05 514.05 255.55 274.50 201.51 277.05 257.05 520.00 557.05 (75)  |
| 6. Solar gains  |
| Access factor Area Solar flux g FF Gains  |
| Table 6d   m²   W/m²   specific data   specific data     or Table 6b   or Table 6c  |
|   |
| SouthWest $0.77 \times 14.79 \times 36.79 \times 0.9 \times 0.72 \times 0.80 = 217.22$ (79)   |
| NorthEast $0.77$ x 4.69 x 11.28 x 0.9 x $0.72$ x $0.80$ = 21.12 (75)  |
|   |
| 238.34 413.00 583.72 754.50 873.61 879.84 843.04 752.25 642.56 461.48 286.76 203.14 (83)  |
| I otal gains - internal and solar (73)m + (83)m   |
| 586.44 759.16 917.58 1068.53 1167.60 1154.42 1104.94 1019.77 920.19 759.13 607.42 540.99 (84)   |
| 7. Mean internal temperature (heating season)   |
| Temperature during heating periods in the living area from Table 9. Th1( $^{\circ}$ C) 21.00 (85)   |
| Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec   |
| Utilisation factor for gains for living area n1.m (see Table 9a)  |
|   |
| Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)   |

20.32 20.53 20.74 20.89 20.94 20.95 20.95 20.95 20.95 20.85 20.56 20.28 (87) Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C) 20.10 20.10 20.08 (88) 20.07 20.07 20.07 20.09 20.09 20.10 20.10 20.09 20.08

| 0.9  | 0.95   | 0.87   | 0.69  | 0.50  | 0.33                                 | 0.22                           | 0.25                           | 0.45  | 0.79   | 0.96  | 0.99  | (89)   |
|--|--|--|---|---|--------------------------------------|--------------------------------|--------------------------------|---|--|---|---|--|
| Mean internal tempera  | ature in the res   | t of dwelling  | g T2 (follow  | / steps 3 to                                  | 7 in Table 9                         | e)                             |                                |   |  |   |   |  |
| 19.  | 18 19.47   | 19.75  | 19.95   | 20.01   | 20.03                                | 20.03                          | 20.03                          | 20.02   | 19.92  | 19.52   | 19.13   | (90)   |
| Living area fraction   |  |  |   |   |                                      |                                |                                | Li  | ving area ÷  | (4) =   | 0.37  | (91)   |
| Mean internal tempera  | ature for the w  | hole dwellin   | g fLA x T1 -  | +(1 - fLA) x <sup>-</sup>                     | Т2                                   |                                |                                |   |  |   |   |  |
| 19.  | 60 19.86   | 20.12  | 20.30   | 20.35   | 20.37                                | 20.37                          | 20.37                          | 20.36   | 20.26  | 19.90   | 19.55   | (92)   |
| Apply adjustment to the  | ne mean interna  | al temperati   | ure from Ta   | able 4e whe                                   | ere appropr                          | iate                           |                                |   |  |   |   |  |
| 19.  | 45 19.71   | 19.97  | 20.15   | 20.20   | 20.22                                | 20.22                          | 20.22                          | 20.21   | 20.11  | 19.75   | 19.40   | (93)   |
| Q Cross bosting your   |  |  |   |   |                                      |                                |                                |   |  |   |   |  |
| 8. Space neating requ  | n Eoh  | Mar  | Anr   | May   | lun                                  | 11                             | Aug                            | For   | Oct  | Nev   | Dec   |  |
| Ja   |  | IVIdi  | Арі   | ividy   | Jun                                  | Jui                            | Aug                            | Sep   | 000  | NOV   | Dec   |  |
|  |  | 0.96   | 0.70  | 0.50  | 0.22                                 | 0.22                           | 0.26                           | 0.46  | 0.70   | 0.06  | 0.00  |  |
|  | (0.95)   | 0.80   | 0.70  | 0.50  | 0.33                                 | 0.23                           | 0.20                           | 0.40  | 0.79   | 0.96  | 0.99  | (94)   |
|  | 20 720 20  | 702.24   | 744.40  | 500.00  | 200.40                               | 240.00                         | 262.45                         | 120.10  | 507 72   | <b>502 70</b>   | 525.45  |  |
| 5//  | .28   720.39   | /93.21   | /44.48  | 586.80  | 386.16                               | 249.06                         | 262.15                         | 420.19  | 597.73   | 582.79  | 535.15  | ] (95)   |
| wonthy average exter   |  |  |   | 44 70   | 14.60                                | 16.60                          | 16.40                          | 1440  | 10.00  | 7.10  | 4.20  |  |
| 4.:  | 30 4.90  | 0.50   | 8.90  | 11.70   | 14.60                                | 16.60                          | 16.40                          | 14.10   | 10.60  | 7.10  | 4.20  | ] (96)   |
|  |  |  | , w [(39)n  | TX [(93)11 -                                  |                                      | 240.40                         | 262.22                         | 422.04  | cc2 <b>7</b> 2   | 007.55  | 4072.25   |  |
| 1080   | 0.16   1052.87   | 954.87   | [ /86.91  | 593.19  | 386.65                               | 249.10                         | 262.23                         | 422.94  | 663.72   | 887.55  | 1072.35   | ] (97)   |
| Space nearing requirer   |  | 120.27   | [(97)m - (9   | 5)m] x (41)                                   |                                      | 0.00                           | 0.00                           | 0.00  | 40.40  | 210.42  | 200.00  | 1  |
| 374  | .14   223.43   | 120.27   | 30.55   | 4.76  | 0.00                                 | 0.00                           | 0.00                           | 00.00   | 49.10  | 219.43  | 399.68  |  |
| Canada hanting an using  |  |  |   |   |                                      |                                |                                | Σ(9)  | 8)15, 10   | .12 =   | 1421.35   | ] (98)<br>] (98)   |
| space neating requirer   | nent kwn/m-/   | year   |   |   |                                      |                                |                                |   | (98)   | ÷ (4)   | 20.25   | ] (99)   |
| 9a. Energy requireme   | ents - individua   | I heating sy   | stems inclu   | uding micro                                   | -CHP                                 |                                |                                |   |  |   |   |  |
| Space heating  |  |  |   |   |                                      |                                |                                |   |  |   |   |  |
| opace neuring  |  |  |   |   |                                      |                                |                                |   |  |   |   |  |
| Fraction of space heat   | from secondar  | y/suppleme   | ntary syste   | m (table 11                                   | L)                                   |                                |                                |   |  |   | 0.00  | (201)  |
| Fraction of space heat<br>Fraction of space heat   | from secondar<br>from main syst  | y/suppleme<br>em(s)  | ntary syste   | m (table 11                                   | L)                                   |                                |                                |   | 1 - (2   | 01) =   | 0.00  | ) (201)<br>(202)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat   | from secondar<br>from main syst<br>from main syst  | y/suppleme<br>em(s)<br>em 2  | ntary syste   | m (table 11                                   | L)                                   |                                |                                |   | 1 - (2   | 01) =   | 0.00 1.00 0.00  | ) (201)<br>) (202)<br>) (202)  |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space  | from secondar<br>from main syst<br>from main syst<br>heat from main  | y/suppleme<br>em(s)<br>em 2<br>n system 1  | ntary syste   | m (table 11                                   | L)                                   |                                |                                | (20   | 1 - (20<br>02) x [1- (20   | 01) =   | 0.00<br>1.00<br>0.00<br>1.00  | ] (201)<br>] (202)<br>] (202)<br>] (204)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main  | y/suppleme<br>em(s)<br>em 2<br>n system 1<br>n system 2  | ntary syste   | rm (table 11                                  | 1)                                   |                                |                                | (20   | 1 - (2)<br>)2) x [1- (20<br>(202) x (2)  | 01) =<br>]3)] =<br>03) =  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00  | ] (201)<br>] (202)<br>] (202)<br>] (202)<br>] (204)<br>] (205)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)  | y/suppleme<br>em(s)<br>em 2<br>n system 1<br>n system 2  | ntary syste   | m (table 11                                   | L)                                   |                                |                                | (20   | 1 - (2<br>)2) × [1- (20<br>(202) × (2  | 01) =<br>[]<br>[]<br>[]<br>[]<br>[]<br>[]<br>[]<br>[]<br>[]<br>[]<br>[]<br>[]<br>[] | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90   | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br>n Feb   | y/suppleme<br>rem(s)<br>rem 2<br>n system 1<br>n system 2<br><b>Mar</b>  | ntary syste<br>Apr  | m (table 11                                   | l)<br>Jun                            | Jul                            | Aug                            | (20<br>Sep  | 1 - (2)<br>)2) × [1- (20<br>(202) × (2)<br>Oct   | 01) =<br>03)] =<br>03) =<br>Nov   | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec  | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup>  | y/suppleme<br>em(s)<br>em 2<br>n system 1<br>n system 2<br><b>Mar</b><br>Wh/month                                  | ntary syste<br>Apr  | m (table 11<br>May                            | L)<br>Jun                            | Jul                            | Aug                            | (20<br>Sep  | 1 - (20<br>02) x [1- (20<br>(202) x (20<br>Oct   | 01) =<br>03)] =<br>03) =<br>Nov   | 0.00<br>1.00<br>1.00<br>1.00<br>89.90<br><b>Dec</b>   | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416  | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>a</sup><br>.18 248.53  | y/suppleme<br>rem(s)<br>rem 2<br>n system 1<br>n system 2<br><b>Mar</b><br>Wh/month<br>133.79                      | ntary syste<br>Apr<br>33.98                                   | m (table 11<br>May<br>5.29                    | 1)<br>Jun<br>0.00                    | <b>Jul</b><br>00.0             | <b>Aug</b>                     | (20<br><b>Sep</b>   | 1 - (2)<br>)2) × [1- (20<br>(202) × (2)<br>Oct<br>54.62  | 01) =<br>03)] =<br>03) =<br>Nov   | 0.00<br>1.00<br>1.00<br>0.00<br>89.90<br>Dec<br>444.58  | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (mained)  | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53  | y/suppleme<br>em(s)<br>em 2<br>n system 1<br>n system 2<br><b>Mar</b><br>Wh/month<br>133.79                        | Apr<br>33.98  | m (table 11<br>May<br>5.29                    | Jun 0.00                             | <b>Jul</b><br>00.0             | <b>Aug</b>                     | (20<br><b>Sep</b><br>0.00<br>Σ(21:                              | 1 - (2)<br>)2) x [1- (20<br>(202) x (2)<br>Oct<br>54.62<br>1)15, 10  | 01) =<br>03)] =<br>03) =<br>Nov<br>244.08<br>.12 =                                  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>444.58<br>1581.04   | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>]<br>] (211)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>a</sup><br>.18 248.53  | y/suppleme<br>eem(s)<br>eem 2<br>n system 1<br>n system 2<br><b>Mar</b><br>Wh/month<br>133.79                      | Apr<br>33.98  | m (table 11<br>May<br>5.29                    | Jun 0.00                             | <b>Jul</b>                     | Aug                            | (20<br><b>Sep</b><br>0.00<br>Σ(21)                              | 1 - (2)<br>)2) × [1- (20<br>(202) × (2)<br>Oct<br>54.62<br>1)15, 10  | 01) =<br>03)] =<br>03) =<br>Nov<br>244.08<br>.12 =                                  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>444.58<br>1581.04   | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)  |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water heat   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53  | y/suppleme<br>rem(s)<br>rem 2<br>n system 1<br>n system 2<br><b>Mar</b><br>Wh/month<br>133.79                      | Apr<br>33.98  | m (table 11<br>May<br>5.29                    | Jun 0.00                             | Jul<br>00.0                    | Aug<br>0.00                    | (20<br><b>Sep</b><br>0.00<br>Σ(21)                              | 1 - (2)<br>)2) x [1- (20<br>(202) x (2)<br><b>Oct</b><br>54.62<br>1)15, 10   | 01) =<br>03)] =<br>03) =<br>Nov<br>244.08<br>.12 =                                  | 0.00<br>1.00<br>0.00<br>1.00<br>89.90<br>Dec<br>4444.58<br>1581.04  | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>]<br>] (211)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water heat<br>89.  | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86   | y/suppleme<br>eem(s)<br>eem 2<br>n system 1<br>n system 2<br><b>Mar</b><br>Wh/month<br>133.79                      | Apr<br>33.98<br>87.76   | m (table 11<br>May<br>5.29<br>87.39           | L)<br>Jun<br>0.00<br>87.30           | Jul<br>0.00<br>87.30           | Aug<br>0.00<br>87.30           | (20<br><b>Sep</b><br>0.00<br>Σ(21)<br>87.30                     | 1 - (2)<br>)2) x [1- (20)<br>(202) x (2)<br>Oct<br>54.62<br>1)15, 10<br>87.95  | 01) =<br>03)] =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84                         | 0.00<br>1.00<br>0.00<br>1.00<br>89.90<br>Dec<br>444.58<br>1581.04<br>89.14  | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>) (206)<br>) (211)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water heat<br>89.<br>Water heating fuel, kW  | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86<br>/h/month   | y/suppleme<br>eem(s)<br>eem 2<br>n system 1<br>n system 2<br>Mar<br>Wh/month<br>133.79<br>88.43                    | Apr<br>33.98<br>87.76   | m (table 11<br>May<br>5.29<br>87.39           | Jun 0.00 87.30                       | Jul<br>0.00<br>87.30           | Aug<br>0.00<br>87.30           | (20<br><b>Sep</b><br>0.00<br>Σ(21)<br>87.30                     | 1 - (2)<br>)2) x [1- (20<br>(202) x (2)<br>Oct<br>54.62<br>1)15, 10<br>87.95   | 01) =<br>03)] =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84                         | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>4444.58<br>1581.04<br>89.14   | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (211)<br>] (217)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water heat<br>89.<br>Water heating fuel, kW  | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86<br>/h/month<br>.50 161.54   | y/suppleme<br>eem(s)<br>eem 2<br>n system 1<br>n system 2<br>Mar<br>Wh/month<br>133.79<br>88.43                    | Apr<br>33.98<br>87.76   | m (table 11<br>May<br>5.29<br>87.39           | L)<br>Jun<br>0.00<br>87.30           | Jul<br>0.00<br>87.30<br>129.68 | Aug<br>0.00<br>87.30           | (20<br>Sep<br>0.00<br>Σ(21)<br>87.30                            | 1 - (2)<br>)2) x [1- (20<br>(202) x (2)<br><b>Oct</b><br>)115, 10<br>87.95   | 01) =<br>03)] =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84<br>166.32               | 0.00<br>1.00<br>0.00<br>1.00<br>89.90<br>Dec<br>444.58<br>1581.04<br>89.14<br>178.25  | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>) (206)<br>) (211)<br>) (217)  |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water heat<br>89.<br>Water heating fuel, kW<br>183   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86<br>/h/month<br>.50 161.54   | y/suppleme<br>eem(s)<br>eem 2<br>n system 1<br>n system 2<br>Mar<br>Wh/month<br>133.79<br>88.43                    | Apr<br>33.98<br>87.76<br>156.86                               | m (table 11<br>May<br>5.29<br>87.39<br>154.15 | Jun<br>0.00<br>87.30<br>136.51       | Jul<br>0.00<br>87.30<br>129.68 | Aug<br>0.00<br>87.30           | (20<br><b>Sep</b><br>0.00<br>Σ(21)<br>87.30<br>144.63           | $1 - (2)$ $)2) \times [1 - (2)$ $(202) \times (2)$ $0ct$ $54.62$ $1)15, 10$ $87.95$ $161.80$ $\Sigma(219a)1$   | 01) =<br>03) =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84<br>166.32<br>.12 =       | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>444.58<br>1581.04<br>89.14<br>89.14<br>178.25<br>1889.96  | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (211)<br>] (211)<br>] (217)<br>] (219)                       |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water hea<br>89.<br>Water heating fuel, kW<br>183<br>Annual totals   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86<br>/h/month<br>.50 161.54   | y/suppleme<br>em(s)<br>eem 2<br>n system 1<br>n system 2<br>Mar<br>Wh/month<br>133.79<br>88.43                     | Apr<br>33.98<br>87.76<br>156.86                               | m (table 11<br>May<br>5.29<br>87.39<br>154.15 | Jun<br>0.00<br>87.30<br>136.51       | Jul<br>0.00<br>87.30<br>129.68 | Aug<br>0.00<br>87.30<br>144.27 | (20<br><b>Sep</b><br>0.00<br>Σ(21)<br>87.30<br>144.63           | $1 - (20) \times [1 - (20) \times [1 - (20) \times $ | 01) =<br>03)] =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84<br>166.32<br>.12 =      | 0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>444.58<br>1581.04<br>89.14<br>178.25<br>1889.96   | ] (201)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (211)<br>] (217)<br>] (219)   |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water heat<br>89.<br>Water heating fuel, kW<br>183<br>Annual totals<br>Space heating fuel - ma   | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86<br>/h/month<br>.50 161.54   | y/suppleme<br>eem(s)<br>eem 2<br>n system 1<br>n system 2<br>Mar<br>Wh/month<br>133.79<br>88.43<br>88.43           | Apr<br>33.98<br>87.76<br>156.86                               | m (table 11<br>May<br>5.29<br>87.39<br>154.15 | Jun<br>0.00<br>87.30                 | Jul<br>0.00<br>87.30<br>129.68 | Aug<br>0.00<br>87.30           | (20<br><b>Sep</b><br>0.00<br>Σ(21:<br>87.30<br>144.63           | $1 - (2)$ $)2) \times [1 - (2)$ $(202) \times (2)$ $0ct$ $54.62$ $1)15, 10$ $87.95$ $161.80$ $\Sigma(219a)1$   | 01) =<br>03) =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84<br>166.32<br>.12 =       | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>444.58<br>1581.04<br>89.14<br>178.25<br>1889.96<br>1581.04  | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (205)<br>] (206)<br>] (206)<br>] (211)<br>] (211)<br>] (217)<br>] (219) |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water hea<br>89.<br>Water heating fuel, kW<br>183<br>Annual totals<br>Space heating fuel - ma<br>Water heating fuel  | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86<br>/h/month<br>.50 161.54   | y/suppleme<br>em(s)<br>em 2<br>n system 1<br>n system 2<br>Mar<br>Wh/month<br>133.79<br>88.43                      | Apr<br>33.98<br>87.76<br>156.86                               | m (table 11<br>May<br>5.29<br>87.39<br>154.15 | Jun<br>0.00<br>87.30<br>136.51       | Jul<br>0.00<br>87.30<br>129.68 | Aug<br>0.00<br>87.30<br>144.27 | (20<br><b>Sep</b><br>0.00<br>Σ(21)<br>87.30<br>144.63           | $1 - (20) \times [1 - (20) \times [1 - (20) \times $ | 01) =<br>03) =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84<br>166.32<br>.12 =       | 0.00<br>1.00<br>0.00<br>1.00<br>89.90<br>Dec<br>4444.58<br>1581.04<br>178.25<br>1889.96<br>1581.04<br>1889.96   | ] (201)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (211)<br>] (217)<br>] (219)<br>]  |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating fuel (ma<br>416<br>Water heating fuel (ma<br>416<br>Water heating fuel , kW<br>183<br>Annual totals<br>Space heating fuel - ma<br>Water heating fuel<br>Electricity for pumps, f  | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86<br>/h/month<br>.50 161.54<br>ain system 1<br>ans and electric                     | y/suppleme<br>eem(s)<br>eem 2<br>n system 1<br>n system 2<br>Mar<br>Wh/month<br>133.79<br>88.43<br>172.45          | Apr<br>33.98<br>87.76<br>156.86<br>Table 4f)                  | m (table 11<br>May<br>5.29<br>87.39           | Jun<br>0.00<br>87.30<br>136.51       | Jul<br>0.00<br>87.30<br>129.68 | Aug<br>0.00<br>87.30<br>144.27 | (20<br><b>Sep</b><br>0.00<br>Σ(21)<br>87.30<br>144.63           | 1 - (2)<br>)2) × [1- (20<br>(202) × (2)<br>Oct<br>54.62<br>1)15, 10<br>87.95<br>161.80<br>Σ(219a)1   | 01) =<br>03) =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84<br>166.32<br>.12 =       | 0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>444.58<br>1581.04<br>89.14<br>178.25<br>1889.96<br>1581.04  | ] (201)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)<br>] (211)<br>] (211)<br>] (217)<br>] (219)                       |
| Fraction of space heat<br>Fraction of space heat<br>Fraction of space heat<br>Fraction of total space<br>Fraction of total space<br>Efficiency of main syste<br>Ja<br>Space heating fuel (ma<br>416<br>Water heating<br>Efficiency of water heat<br>89.<br>Water heating fuel, kW<br>183<br>Annual totals<br>Space heating fuel - me<br>Water heating fuel - me | from secondar<br>from main syst<br>from main syst<br>heat from main<br>heat from main<br>em 1 (%)<br><b>n Feb</b><br>in system 1), k <sup>1</sup><br>.18 248.53<br>ter<br>09 88.86<br>/h/month<br>.50 161.54<br>ain system 1<br>ans and electric<br>ion fans - balar | y/suppleme<br>eem(s)<br>eem 2<br>n system 1<br>n system 2<br>Mar<br>Wh/month<br>133.79<br>88.43<br>88.43<br>172.45 | Apr<br>33.98<br>87.76<br>156.86<br>Table 4f)<br>t or positive | m (table 11<br>May<br>5.29<br>87.39<br>154.15 | l)<br>Jun<br>0.00<br>87.30<br>136.51 | Jul<br>0.00<br>87.30<br>129.68 | Aug<br>0.00<br>87.30<br>144.27 | (20<br><b>Sep</b><br>0.00<br>Σ(21)<br>87.30<br>144.63<br>111.34 | 1 - (2)<br>(202) × [1- (20)<br>(202) × (2)<br>Oct<br>54.62<br>1)15, 10<br>87.95<br>161.80<br>Σ(219a)1  | 01) =<br>03) =<br>Nov<br>244.08<br>.12 =<br>88.84<br>166.32<br>.12 =                | 0.00         1.00         0.00         1.00         0.00         89.90         Dec         4444.58         1581.04         89.14         178.25         1889.96         1581.04 | ) (201)<br>(202)<br>(204)<br>(205)<br>(206)<br>(211)<br>(211)<br>(217)<br>(219)<br>(219)   |

| central heating pump or water pump within warm a       | air heating unit   |   | 30.00                              |                                       | (230c) |
|--|--------------------|---|------------------------------------|---------------------------------------|--------|
| boiler flue fan  |                    |   | 45.00                              |                                       | (230e) |
| Total electricity for the above, kWh/year              |                    |   |                                    | 186.34                                | (231)  |
| Electricity for lighting (Appendix L)                  |                    |   |                                    | 311.36                                | (232)  |
| Total delivered energy for all uses                    |                    | ( | (211)(221) + (231) + (232)(237b) = | = 3968.70                             | (238)  |
| 10a. Fuel costs - individual heating systems including | g micro-CHP        |   |                                    |                                       |        |
|  | Fuel               |   | Fuel price                         | Fuel                                  |        |
|  | kWh/year           |   |                                    | cost £/year                           |        |
| Space heating - main system 1                          | 1581.04            | х | 3.48 x 0.01 =                      | 55.02                                 | (240)  |
| Water heating  | 1889.96            | х | 3.48 x 0.01 =                      | 65.77                                 | (247)  |
| Pumps and fans   | 186.34             | х | 13.19 x 0.01 =                     | 24.58                                 | (249)  |
| Electricity for lighting                               | 311.36             | х | 13.19 x 0.01 =                     | 41.07                                 | (250)  |
| Additional standing charges                            |                    |   |                                    | 120.00                                | (251)  |
| Total energy cost                                      |                    |   | (240)(242) + (245)(254) =          | = 306.44                              | (255)  |
| 11a. SAP rating - individual heating systems including | g micro-CHP        |   |                                    |                                       |        |
| Energy cost deflator (Table 12)                        |                    |   |                                    | 0.42                                  | (256)  |
| Energy cost factor (ECF)                               |                    |   |                                    | 1.12                                  | (257)  |
| SAP value  |                    |   |                                    | 84.41                                 |        |
| SAP rating (section 13)                                |                    |   |                                    | 84                                    | (258)  |
| SAP band   |                    |   |                                    | В                                     | ]      |
| 12a. CO2 emissions - individual heating systems inclu  | iding micro-CHP    |   |                                    |                                       |        |
|  | Energy<br>kWh/year |   | Emission factor<br>kg CO₂/kWh      | Emissions<br>kg CO <sub>2</sub> /year |        |
| Space heating - main system 1                          | 1581.04            | x | 0.22 =                             | 341.50                                | (261)  |

1889.96

186.34

311.36

0.22

0.52

0.52

=

=

=

(265)...(271) =

(272) ÷ (4) =

(261) + (262) + (263) + (264) =

х

х

х

Space and water heating

Pumps and fans

Water heating

Electricity for lighting

Total CO<sub>2</sub>, kg/year Dwelling CO<sub>2</sub> emission rate

El value

El rating (section 14)

EI band

#### 13a. Primary energy - individual heating systems including micro-CHP

|  | Energy<br>kWh/year |   | Primary factor  |                 | Primary Energy<br>kWh/year |       |
|--|--------------------|---|-----------------|-----------------|----------------------------|-------|
| Space heating - main system 1            | 1581.04            | x | 1.22            | =               | 1928.86                    | (261) |
| Water heating                            | 1889.96            | х | 1.22            | =               | 2305.75                    | (264) |
| Space and water heating                  |                    |   | (261) + (262) + | (263) + (264) = | 4234.61                    | (265) |
| Pumps and fans                           | 186.34             | x | 3.07            | =               | 572.06                     | (267) |
| Electricity for lighting                 | 311.36             | х | 3.07            | =               | 955.89                     | (268) |
| Primary energy kWh/year                  |                    |   |                 |                 | 5762.56                    | (272) |
| Dwelling primary energy rate kWh/m2/year |                    |   |                 |                 | 82.09                      | (273) |

408.23

749.73

96.71

161.60

1008.04

14.36

88.27

88

В

(264)

(265)

(267)

(268)

(272)

(273)

(274)

### DER Worksheet Design - Draft



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

| Assessor name          |             | Mr John       | Simpson       |               |                  |                         |                     |            | Assessor nur                | nber           | 3722  |                    |            |
|------------------------|-------------|---------------|---------------|---------------|------------------|-------------------------|---------------------|------------|-----------------------------|----------------|-------|--------------------|------------|
| Client                 |             |               |               |               |                  |                         |                     |            | Last modified               | d              | 19/11 | /2014              |            |
| Address                |             | Unit 1.02     | 2 Marine Ice  | es Haversto   | ock Hill, Lo     | ndon, NW3               | 2BL                 |            |                             |                |       |                    |            |
|                        |             |               |               |               |                  | -                       |                     |            |                             |                |       |                    |            |
| 1. Overall dwellin     | g dimen     | sions         |               |               |                  |                         |                     |            |                             |                |       |                    |            |
|                        |             |               |               |               | 1                | Area (m²)               |                     | Av         | verage storey<br>height (m) | 1              | Va    | lume (m³)          |            |
| Lowest occupied        |             |               |               |               |                  | 49.80                   | <mark>(1a)</mark> x |            | 2.60                        | (2a) =         |       | 129.48             | (3a)       |
| Total floor area       |             | (1a)          | + (1b) + (1   | c) + (1d)(    | 1n) =            | 49.80                   | (4)                 |            |                             |                |       |                    |            |
| Dwelling volume        |             |               |               |               |                  |                         |                     | (3         | 3a) + (3b) + (3             | 3c) + (3d)(3   | in) = | 129.48             | ] (5)      |
| 2. Ventilation rate    | e           |               |               |               |                  |                         |                     |            |                             |                |       |                    |            |
|                        |             |               |               |               |                  |                         |                     |            |                             |                | m     | ³ per hour         |            |
| Number of chimner      | ys          |               |               |               |                  |                         |                     | Г          | 0                           | x 40 =         |       | 0                  | (6a)       |
| Number of open flu     | Jes         |               |               |               |                  |                         |                     | Ē          | 0                           | x 20 =         |       | 0                  | <br>] (6b) |
| Number of intermit     | ttent fan   | s             |               |               |                  |                         |                     |            | 0                           | x 10 =         |       | 0                  | (7a)       |
| Number of passive      | vents       |               |               |               |                  |                         |                     |            | 0                           | x 10 =         |       | 0                  | (7b)       |
| Number of flueless     | gas fires   | 5             |               |               |                  |                         |                     |            | 0                           | x 40 =         |       | 0                  | ] (7c)     |
|                        |             |               |               |               |                  |                         |                     |            |                             |                | Air o | hanges pei<br>hour | r          |
| Infiltration due to o  | himneys     | s, flues, fan | s, PSVs       |               | (6a              | ı) + (6b) + (7          | 7a) + (7b) + (      | (7c) =     | 0                           | ÷ (5) =        |       | 0.00               | (8)        |
| If a pressurisation t  | test has b  | been carrie   | d out or is i | ntended, p    | roceed to        | (17), otherv            | vise continu        | ie from (9 | 9) to (16)                  |                |       |                    |            |
| Air permeability va    | lue, q50,   | expressed     | in cubic m    | etres per h   | our per sc       | luare metre             | of envelop          | e area     |                             |                |       | 3.00               | (17)       |
| If based on air pern   | neability   | value, the    | n (18) = [(17 | 7) ÷ 20] + (8 | 3), otherw       | ise (18) = (1           | L6)                 |            |                             |                |       | 0.15               | ] (18)     |
| Number of sides or     | n which t   | he dwelling   | g is sheltere | ed            |                  |                         |                     |            |                             |                |       | 2                  | (19)       |
| Shelter factor         |             |               |               |               |                  |                         |                     |            | 1                           | - [0.075 x (19 | 9)] = | 0.85               | (20)       |
| Infiltration rate inco | orporatir   | ng shelter f  | actor         |               |                  |                         |                     |            |                             | (18) x (2      | 20) = | 0.13               | (21)       |
| Infiltration rate mo   | dified fo   | r monthly v   | wind speed    | :             |                  |                         |                     |            |                             |                |       |                    |            |
|                        | Jan         | Feb           | Mar           | Apr           | May              | Jun                     | Jul                 | Aug        | Sep                         | Oct            | Nov   | Dec                |            |
| Monthly average w      | and spee    | d from Tab    | ole U2        |               |                  | 1                       |                     |            |                             | 1              |       |                    | 7 (22)     |
| Wind faster (22)       | 5.10        | 5.00          | 4.90          | 4.40          | 4.30             | 3.80                    | 3.80                | 3.70       | 4.00                        | 4.30           | 4.50  | 4.70               | ] (22)     |
|                        | - 4<br>1 20 | 1.25          | 1 22          | 1 10          | 1.09             | 0.05                    | 0.05                | 0.02       | 1.00                        | 1.09           | 1 1 2 | 1 1 0              | 7 (222)    |
| Adjusted infiltration  | n rate (al  | 1.25          | shelter and   | 1.10          | 1.08<br>(21) x ( | 0.95                    | 0.95                | 0.93       | 1.00                        | 1.08           | 1.13  | 1.18               | ] (22d)    |
|                        | 0.16        | 0.16          |               |               | 0 14             | 0.12                    | 0.12                | 0.12       | 0.13                        | 0.14           | 0 14  | 0.15               | ] (22h)    |
| Calculate effective    | air chang   | ge rate for   | the applica   | ble case:     | 0.11             | 0.12                    | 0.12                | 0.12       | 0.15                        | 0.11           | 0.11  | 0.13               | ] (220)    |
| If mechanical ve       | entilation  | n: air chang  | e rate throu  | ugh system    |                  |                         |                     |            |                             |                |       | 0.50               | (23a)      |
| If balanced with       | heat red    | covery: effi  | ciency in %   | allowing for  | or in-use f      | actor from <sup>-</sup> | Table 4h            |            |                             |                |       | 79.90              | ] (23c)    |
| a) If balanced m       | echanica    | al ventilatio | n with hea    | t recovery    | (MVHR) (2        | 22b)m + (23             | sb) x [1 - (23      | c) ÷ 100]  |                             |                |       |                    | <u> </u>   |
| Γ                      | 0.26        | 0.26          | 0.26          | 0.24          | 0.24             | 0.22                    | 0.22                | 0.22       | 0.23                        | 0.24           | 0.24  | 0.25               | (24a)      |
| Effective air change   | e rate - e  | nter (24a) (  | or (24b) or   | (24c) or (24  | 1d) in (25)      |                         |                     |            |                             |                |       |                    |            |
|                        | 0.26        | 0.26          | 0.26          | 0.24          | 0.24             | 0.22                    | 0.22                | 0.22       | 0.23                        | 0.24           | 0.24  | 0.25               | (25)       |



| 3. Heat losses a    | and heat lo     | ss paramet     | er           |                              |                            |                       |                         |                  |              |                           |                 |              |        |
|---------------------|-----------------|----------------|--------------|------------------------------|----------------------------|-----------------------|-------------------------|------------------|--------------|---------------------------|-----------------|--------------|--------|
| Element             |                 |                | а            | Gross<br>rea, m <sup>2</sup> | Openings<br>m <sup>2</sup> | Net<br>A,             | t area<br>, m²          | U-value<br>W/m²K | A x U V      | V/К к- <sup>,</sup><br>kJ | value,<br>/m².K | Ахк,<br>kJ/K |        |
| Window              |                 |                |              |                              |                            | 15                    | 5.32 x                  | 1.33             | = 20.3       | 1                         |                 |              | (27)   |
| Door                |                 |                |              |                              |                            | 2                     | .14 x                   | 1.10             | = 2.35       | 5                         |                 |              | (26)   |
| Exposed floor       |                 |                |              |                              |                            | 49                    | 9.80 x                  | 0.10             | = 4.98       | 3                         |                 |              | (28b   |
| External wall       |                 |                |              |                              |                            | 46                    | 6.53 x                  | 0.20             | = 9.31       |                           |                 |              | (29a)  |
| Party wall          |                 |                |              |                              |                            | 13                    | 3.34 x                  | 0.00             | = 0.00       | )                         |                 |              | (32)   |
| Total area of ext   | ernal elem      | ents ∑A, m²    | 1            |                              |                            | 11                    | 3.79                    |                  |              |                           |                 |              | (31)   |
| Fabric heat loss,   | W/K = ∑(A       | × U)           |              |                              |                            |                       |                         |                  | (2           | (30) + (                  | 32) =           | 36.95        | (33)   |
| Heat capacity Cr    | n = ∑(А x к)    | )              |              |                              |                            |                       |                         | (28)             | .(30) + (32) | + (32a)(3                 | 2e) =           | N/A          | (34)   |
| Thermal mass pa     | arameter (1     | ГМР) in kJ/r   | n²K          |                              |                            |                       |                         |                  |              |                           |                 | 250.00       | (35)   |
| Thermal bridges     | : Σ(L x Ψ) c    | alculated us   | sing Appen   | dix K                        |                            |                       |                         |                  |              |                           |                 | 8.52         | (36)   |
| Total fabric heat   | loss            |                |              |                              |                            |                       |                         |                  |              | (33) + (                  | 36) =           | 45.47        | (37)   |
|                     | Jan             | Feb            | Mar          | Apr                          | May                        | Jun                   | Jul                     | Aug              | Sep          | Oct                       | Nov             | Dec          |        |
| Ventilation heat    | loss calcul     | ated month     | ly 0.33 x (2 | 25)m x (5)                   |                            |                       |                         |                  |              |                           |                 |              |        |
|                     | 11.24           | 11.10          | 10.97        | 10.29                        | 10.15                      | 9.47                  | 9.47                    | 9.33             | 9.74         | 10.15                     | 10.42           | 10.70        | (38)   |
| Heat transfer co    | efficient, V    | V/K (37)m +    | - (38)m      |                              |                            |                       |                         |                  |              |                           |                 |              |        |
|                     | 56.71           | 56.57          | 56.44        | 55.76                        | 55.62                      | 54.94                 | 54.94                   | 54.80            | 55.21        | 55.62                     | 55.89           | 56.16        |        |
|                     |                 |                |              |                              |                            |                       |                         |                  | Average =    | ∑(39)112                  | /12 =           | 55.72        | (39)   |
| Heat loss param     | eter (HLP),     | W/m²K (39      | 9)m ÷ (4)    |                              |                            |                       |                         |                  |              |                           |                 |              |        |
|                     | 1.14            | 1.14           | 1.13         | 1.12                         | 1.12                       | 1.10                  | 1.10                    | 1.10             | 1.11         | 1.12                      | 1.12            | 1.13         |        |
|                     |                 |                |              |                              |                            |                       |                         |                  | Average =    | ∑(40)112                  | /12 =           | 1.12         | (40)   |
| Number of days      | in month (      | Table 1a)      |              |                              |                            |                       |                         |                  |              |                           |                 |              |        |
|                     | 31.00           | 28.00          | 31.00        | 30.00                        | 31.00                      | 30.00                 | 31.00                   | 31.00            | 30.00        | 31.00                     | 30.00           | 31.00        | (40)   |
|                     |                 |                |              |                              |                            |                       |                         |                  |              |                           |                 |              |        |
| 4. water neath      | ng energy i     | requiremen     | τ            |                              |                            | -                     |                         |                  |              |                           |                 | 1.60         |        |
| Assumed occupa      | incy, N         |                |              |                              | (25 . 11)                  | 26                    |                         |                  |              |                           |                 | 1.68         | (42)   |
| Annual average      | not water i     | usage in litre | es per day   | vd,average                   | e = (25 x N) +             | 36                    |                         | <b>A</b>         | Com          | Ort                       |                 | 74.20<br>Dec | _ (43) |
|                     | Jan             | rep            | iviar        | Apr                          | iviay                      | Jun                   | Jui                     | Aug              | sep          | Uct                       | NOV             | Dec          |        |
| Hot water usage     | in litres pe    |                |              |                              |                            | ie 10 x (4:           | 3)                      |                  | 72 72        | 75.00                     | 70.05           | 01.62        | 7      |
|                     | 81.62           | /8.65          | 75.68        | 12.12                        | 69.75                      | 66.78                 | 66.78                   | 69.75            | 12.12        | 75.68                     | /8.65           | 81.62        |        |
| Franciscontant      | .f. h. a.t a.t. |                |              |                              |                            | anth (ac              |                         | 1 - 1 - 1        |              | <u>&gt;</u> (44)1         | 12 =            | 890.40       | _ (44) |
| Energy content of   |                 | er used = 4    |              |                              | 3600 kwn/m                 |                       |                         | , 10 10)         | 04.05        | 00.00                     | 107.04          | 447.22       | 7      |
|                     | 121.04          | 105.86         | 109.24       | 95.24                        | 91.38                      | 78.86                 | /3.07                   | 83.85            | 84.85        | 98.89                     | 107.94          | 117.22       |        |
| Distribution loss   | 0.15 / 45       | 1              |              |                              |                            |                       |                         |                  |              | <u>&gt;</u> (45)1         | 12 =            | 1167.46      | _ (45) |
| DISTRIBUTION IOSS   | 0.15 X (45      | )m             | 16.20        | 11.20                        | 42.74                      | 11.02                 | 10.00                   | 12.50            | 12 72        | 14.02                     | 16.10           | 47.50        |        |
| Watar starage la    | 18.16           | 15.88          | 16.39        | 14.29                        | 13.71                      | 11.83                 | 10.96                   | 12.58            | 12.73        | 14.83                     | 16.19           | 17.58        | _ (46) |
| water storage it    |                 |                |              | 5) x (41)m                   | 0.00                       | 0.00                  | 0.00                    | 0.00             | 0.00         | 0.00                      | 0.00            | 0.00         |        |
|                     |                 | 0.00           | 0.00         |                              |                            | 0.00                  | 0.00                    | 0.00             | 0.00         | 0.00                      | 0.00            | 0.00         | _ (56) |
| If the vessel con   |                 |                | torage or d  |                              |                            | n x [(47) -           | $-vs_{j} \div (47)_{j}$ | , else (56)      | 0.00         | 0.00                      | 0.00            | 0.00         |        |
| Duinnem coincuit le | 0.00            | 0.00           | 0.00         | 0.00                         | 0.00                       | 0.00                  | 0.00                    | 0.00             | 0.00         | 0.00                      | 0.00            | 0.00         | _ (57) |
| Primary circuit ic  |                 |                |              | 0.00                         |                            | 0.00                  | 0.00                    | 0.00             | 0.00         | 0.00                      | 0.00            | 0.00         |        |
| Combi loss for -    |                 | from Table     | 0.00         |                              | 0.00                       | 0.00                  | 0.00                    | 0.00             | 0.00         | 0.00                      | 0.00            | 0.00         | ] (59) |
| Compriss for ea     |                 |                |              |                              |                            | 20.01                 | 26.00                   | 26.00            | 26.04        | 26.00                     | 20.01           | 26.00        |        |
| Total boat require  | 20.88           | 24.28          |              | 20.01                        | 20.88                      | 20.01                 | 20.88                   | 20.88            | 26.01        | 26.88                     | 26.01           | 26.88        | _ (61) |
| rotar neat requi    |                 |                |              |                              |                            | 45/III + (4<br>104 07 |                         | 110 70           |              | 105 77                    | 122.00          | 144.40       |        |
|                     | 147.92          | 130.14         | 136.12       | 121.25                       | 118.26                     | 104.87                | 99.95                   | 110.73           | 110.87       | 125.//                    | 133.96          | 144.10       | _ (62) |

| Solar DHW inpu     | t calculated  | using Appe    | ndix G or A       | ppendix H     |               |             |                 |                |                           |                              |           |            |        |
|--------------------|---------------|---------------|-------------------|---------------|---------------|-------------|-----------------|----------------|---------------------------|------------------------------|-----------|------------|--------|
|                    | 0.00          | 0.00          | 0.00              | 0.00          | 0.00          | 0.00        | 0.00            | 0.00           | 0.00                      | 0.00                         | 0.00      | 0.00       | (63)   |
| Flue gas heat re   | covery syste  | em 1 input (/ | Appendix (        | G1)           |               |             |                 | •              |                           |                              |           |            |        |
|                    | -6.06         | -5.46         | -3.18             | -0.92         | -0.17         | 0.00        | 0.00            | 0.00           | 0.00                      | -1.41                        | -5.32     | -6.10      | (63)   |
| Output from wa     | iter heater f | for each mor  | nth (kWh/r        | month) (62    | 2)m + (63)m   | 1           |                 |                |                           |                              |           |            |        |
|                    | 141.86        | 124.68        | 132.94            | 120.33        | 118.09        | 104.87      | 99.95           | 110.73         | 110.87                    | 124.36                       | 128.63    | 138.00     | ]      |
|                    |               |               |                   |               |               |             |                 |                |                           | ∑(64)1                       | 12 = 1    | 455.32     | (64)   |
| Heat gains from    | water heat    | ing (kWh/m    | onth) 0.25        | 5 × [0.85 × ( | (45)m + (61   | )m] + 0.8 × | [(46)m + (      | 57)m + (59)    | m]                        |                              |           |            |        |
|                    | 46.97         | 41.27         | 43.04             | 38.17         | 37.11         | 32.72       | 31.02           | 34.60          | 34.72                     | 39.60                        | 42.39     | 45.70      | (65)   |
| 5 Internal gair    | 25            |               |                   |               |               |             |                 |                |                           |                              |           |            |        |
| 5. Internal gain   | Jan           | Feb           | Mar               | Apr           | Mav           | Jun         | Jul             | Aug            | Sep                       | Oct                          | Nov       | Dec        |        |
| Metabolic gains    | (Table 5)     |               |                   | ·             |               |             |                 |                |                           |                              | -         |            |        |
| Wietubolie Bullis  | 94.21         | 94.21         | 94 21             | 9/ 21         | 94.21         | 94.21       | 94 21           | 84.21          | 94.21                     | 94.21                        | 94 21     | 94.21      | (66)   |
| Lighting goins (c  | o4.21         | Appondix I    | oquation          | 04.21         | 04.21         | 04.21       | 04.21           | 04.21          | 04.21                     | 04.21                        | 04.21     | 04.21      | ] (00) |
|                    |               |               |                   |               |               |             | 1.00            | 6.24           | 0.54                      | 10.00                        | 12.64     | 12.14      |        |
| A                  | 13.08         | 11.62         | 9.45              | 7.15          | 5.35          | 4.51        | 4.88            | 6.34           | 8.51                      | 10.80                        | 12.61     | 13.44      | (67)   |
| Appliance gains    | (calculated   |               | L, equatio        | on L13 or L1  | L3a), aiso se | e Table 5   |                 |                |                           |                              |           |            | 1      |
|                    | 146.71        | 148.24        | 144.40            | 136.23        | 125.92        | 116.23      | 109.76          | 108.24         | 112.07                    | 120.24                       | 130.55    | 140.24     | ] (68) |
| Cooking gains (c   | alculated in  | n Appendix L  | , equation        | L15 or L15    | a), also see  | Table 5     |                 |                | 1                         |                              |           |            | 1      |
|                    | 31.42         | 31.42         | 31.42             | 31.42         | 31.42         | 31.42       | 31.42           | 31.42          | 31.42                     | 31.42                        | 31.42     | 31.42      | (69)   |
| Pump and fan g     | ains (Table ! | 5a)           |                   |               |               |             |                 |                | <u></u>                   |                              |           |            | _      |
|                    | 3.00          | 3.00          | 3.00              | 3.00          | 3.00          | 3.00        | 3.00            | 3.00           | 3.00                      | 3.00                         | 3.00      | 3.00       | (70)   |
| Losses e.g. evap   | oration (Tal  | ble 5)        |                   |               |               |             |                 |                |                           |                              |           |            |        |
|                    | -67.37        | -67.37        | -67.37            | -67.37        | -67.37        | -67.37      | -67.37          | -67.37         | -67.37                    | -67.37                       | -67.37    | -67.37     | (71)   |
| Water heating g    | ains (Table   | 5)            |                   |               |               |             |                 |                |                           |                              |           |            |        |
|                    | 63.13         | 61.41         | 57.85             | 53.01         | 49.87         | 45.45       | 41.69           | 46.51          | 48.22                     | 53.23                        | 58.88     | 61.42      | (72)   |
| Total internal ga  | ains (66)m -  | + (67)m + (68 | 3)m + (69)ı       | m + (70)m ·   | + (71)m + (7  | 72)m        |                 |                |                           |                              |           |            |        |
|                    | 274.18        | 272.53        | 262.96            | 247.66        | 232.41        | 217.46      | 207.59          | 212.35         | 220.06                    | 235.54                       | 253.31    | 266.37     | (73)   |
|                    |               |               |                   |               |               |             |                 |                |                           |                              |           |            |        |
| 6. Solar gains     |               |               |                   |               |               |             |                 |                |                           |                              |           |            |        |
|                    |               |               | Access f<br>Table | actor<br>6d   | Area<br>m²    | Sola<br>W   | ar flux<br>//m² | speci<br>or Ta | g<br>ific data<br>able 6b | FF<br>specific d<br>or Table | ata<br>6c | Gains<br>W |        |
| SouthWest          |               |               | 0.7               | 7 X           | 10.63         | x 36        | 6.79 x          | 0.9 x 0        | ).72 x                    | 0.80                         | =         | 156.12     | (79)   |
| NorthEast          |               |               | 0.7               | 7 X           | 4.69          | x 11        | 1.28 x          | 0.9 x 0        | ).72 x                    | 0.80                         | =         | 21.12      | (75)   |
| Solar gains in wa  | atts ∑(74)m   | n(82)m        |                   |               |               |             |                 |                |                           |                              |           |            |        |
|                    | 177.24        | 308.93        | 441.33            | 578.06        | 675.99        | 683.64      | 653.89          | 578.91         | 488.38                    | 346.46                       | 213.58    | 150.86     | (83)   |
| Total gains - inte | ernal and so  | olar (73)m +  | (83)m             |               |               |             |                 |                |                           |                              |           | -          | •      |
| -                  | 451.43        | 581.46        | 704.29            | 825.73        | 908.40        | 901.10      | 861.47          | 791.26         | 708.44                    | 581.99                       | 466.88    | 417.22     | (84)   |
| 7 Magnister        |               | turo (heatin  | a conserv)        |               |               |             |                 |                |                           |                              |           |            |        |
| 7. Wean Intern     | iai tempera   | ture (neath   | g season)         |               |               |             |                 |                |                           |                              |           |            | 1      |

| Temperature during heating periods in the living area from Table 9, Th1(°C)      |             |              |             |             |       |       |       |       |       |       |       | 21.00 (85 |      |  |
|--|-------------|--------------|-------------|-------------|-------|-------|-------|-------|-------|-------|-------|-----------|------|--|
|  | Jan         | Feb          | Mar         | Apr         | Мау   | Jun   | Jul   | Aug   | Sep   | Oct   | Nov   | Dec       |      |  |
| Utilisation factor for gains for living area n1,m (see Table 9a)                 |             |              |             |             |       |       |       |       |       |       |       |           |      |  |
|  | 0.99        | 0.96         | 0.89        | 0.74        | 0.56  | 0.39  | 0.28  | 0.32  | 0.53  | 0.83  | 0.97  | 0.99      | (86) |  |
| Mean internal te   | mp of livin | g area T1 (s | teps 3 to 7 | in Table 9c | :)    |       |       |       |       |       |       |           |      |  |
|  | 20.24       | 20.45        | 20.68       | 20.86       | 20.93 | 20.95 | 20.95 | 20.95 | 20.94 | 20.82 | 20.49 | 20.19     | (87) |  |
| Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C) |             |              |             |             |       |       |       |       |       |       |       |           |      |  |
|  | 19.97       | 19.97        | 19.97       | 19.98       | 19.99 | 20.00 | 20.00 | 20.00 | 19.99 | 19.99 | 19.98 | 19.98     | (88) |  |

| Utilisation factor   | for gains fo  | r rest of d   | welling n2,   | m  |                                   |   |                                |                                |   |   |  |   |   |
|--|---|---|---|--|-----------------------------------|---|--------------------------------|--------------------------------|---|---|--|---|---|
|  | 0.98  | 0.95  | 0.87  | 0.70   | 0.50                              | 0.33                                    | 0.22                           | 0.25                           | 0.45  | 0.79  | 0.96   | 0.99  | (89)  |
| Mean internal te   | mperature i   | n the rest  | of dwelling   | g T2 (follow   | steps 3 to                        | 7 in Table 9                            | e)                             |                                |   |   |  |   |   |
|  | 18.97   | 19.27   | 19.58   | 19.82  | 19.90                             | 19.92                                   | 19.92                          | 19.92                          | 19.91   | 19.78   | 19.34  | 18.91   | (90)  |
| Living area fracti   | on  |   |   |  |                                   |   |                                |                                | Li  | ving area ÷   | (4) =  | 0.50  | (91)  |
| Mean internal te   | mperature f   | for the wh  | ole dwellin   | g fLA x T1 +   | +(1 - fLA) x                      | Т2                                      |                                |                                |   |   |  |   |   |
|  | 19.60   | 19.85   | 20.13   | 20.34  | 20.41                             | 20.43                                   | 20.43                          | 20.43                          | 20.42   | 20.29   | 19.91  | 19.55   | (92)  |
| Apply adjustmen  | it to the mea   | an interna  | l temperati   | ure from Ta  | ble 4e whe                        | ere appropr                             | iate                           |                                |   |   |  |   |   |
|  | 19.45   | 19.70   | 19.98   | 20.19  | 20.26                             | 20.28                                   | 20.28                          | 20.28                          | 20.27   | 20.14   | 19.76  | 19.40   | (93)  |
| 8 Space heatin   | g requireme   | ont   |   |  |                                   |   |                                |                                |   |   |  |   |   |
| or opute neutin  | lan   | Feb   | Mar   | Apr  | May                               | lun                                     | Iul                            | Διισ                           | Sen   | Oct   | Nov  | Dec   |   |
| Utilisation factor   | for gains in  | m   |   |  | may                               | <b>5</b> 411                            | 501                            | , tog                          | Jeb   | 000   |  |   |   |
| o this ation factor  |   | 0.95  | 0.87  | 0.71   | 0.51                              | 0.35                                    | 0.23                           | 0.27                           | 0.48  | 0.80  | 0.96   | 0.99  | (94)  |
| Useful gains, nm   | Gm. W (94)  | m x (84)m   | 1 0.07  | 0.71   | 0.51                              | 0.55                                    | 0.23                           | 0.27                           | 0.40  | 0.00  | 0.50   | 0.55  | ] (34)  |
| eccial Barris) ilin  |   | 550 14  | 609.92  | 583 51   | 467 69                            | 311 16                                  | 202 11                         | 212 55                         | 336 59  | 463 50  | 446 41   | 411 64  | (95)  |
| Monthly average  | external te   | mperature   | e from Tabl   | e U1   | 107103                            | 511.10                                  | 202.11                         | 212.00                         | 550.55  | 105.50  | 110.11   | 111.01  | ] (33)  |
| ,  | 4.30  | 4.90  | 6.50  | 8.90   | 11.70                             | 14.60                                   | 16.60                          | 16.40                          | 14.10   | 10.60   | 7.10   | 4.20  | (96)  |
| Heat loss rate fo  | r mean inter  | nal tempe   | erature, Lm   | , W [(39)m   | x [(93)m -                        | (96)m]                                  | 10.00                          | 1 10/10                        | 1 1.120   | 10.00   | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,  |   | ] (30)  |
|  | 858.98  | 837.46  | 760.50  | 629.22   | 475.99                            | 311.99                                  | 202.20                         | 212.71                         | 340.63  | 530.76  | 707.45   | 853.67  | (97)  |
| Space heating re   | quirement, l  | kWh/mon   | th 0.024 x  | [(97)m - (9  | 5)m] x (41)                       | m                                       |                                |                                |   |   |  |   |   |
|  | 309.47  | 193.08  | 112.03  | 32.92  | 6.18                              | 0.00                                    | 0.00                           | 0.00                           | 0.00  | 50.04   | 187.95   | 328.87  | ]   |
|  | L   |   |   |  |                                   |   |                                |                                | Σ(98  | 3)15, 10  | .12 =  | 1220.53   | (98)  |
| Space heating re   | quirement k   | :<br>Wh/m²/y  | ear   |  |                                   |   |                                |                                |   | (98)  | ÷ (4)  | 24.51   | (99)  |
|  |   |   |   |  |                                   |   |                                |                                |   |   |  |   |   |
|  |   |   |   |  |                                   |   |                                |                                |   |   |  |   |   |
| 9a. Energy requ  | iirements - i   | ndividual   | heating sys   | stems inclu  | iding micro                       | o-CHP                                   |                                |                                |   |   |  |   |   |
| 9a. Energy requ<br>Space heating   | iirements - i   | ndividual   | heating sys   | stems inclu  | iding micro                       | O-CHP                                   |                                |                                |   |   |  |   | 1   |
| 9a. Energy requ<br>Space heating<br>Fraction of space  | irements - i  | ndividual   | heating sys   | stems inclu<br>ntary syste   | iding micro<br>m (table 11        | D-CHP                                   |                                |                                |   |   |  | 0.00  | (201)   |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space   | e heat from s   | ndividual<br>secondary<br>main syste  | heating sys<br>/suppleme<br>em(s)   | stems inclu<br>ntary system  | nding micro                       | D-CHP<br>L)                             |                                |                                |   | 1 - (20   | 01) =  | 0.00  | ) (201)<br>) (202)  |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space   | e heat from s<br>heat from r<br>heat from r   | ndividual<br>secondary<br>main syste<br>main syste  | heating sys<br>/suppleme<br>em(s)<br>em 2   | stems inclu<br>ntary syste   | iding micro                       | D-CHP<br>L)                             |                                |                                |   | 1 - (20   | 01) =  | 0.00 1.00 0.00  | (201)<br>(202)<br>(202)   |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total   | e heat from s<br>e heat from s<br>e heat from r<br>e heat from r<br>space heat f  | ndividual<br>secondary<br>main syste<br>main syste  | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1   | stems incluntary syste   | iding micro                       | D-CHP<br>L)                             |                                |                                | (20   | 1 - (20<br>)2) x [1- (20  | 01) =  | 0.00<br>1.00<br>0.00<br>1.00  | ) (201)<br>) (202)<br>] (202)<br>] (204)  |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total   | e heat from s<br>heat from s<br>heat from r<br>heat from r<br>space heat f<br>space heat f  | ndividual<br>secondary<br>main syste<br>main syste<br>from main   | heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2  | stems inclu<br>ntary syste   | nding micro                       | D-CHP<br>L)                             |                                |                                | (20   | 1 - (20<br>)2) x [1- (20<br>(202) x (20   | 01) =<br>[]]<br>[]]<br>[]]<br>[]]<br>[]]<br>[]]<br>[]]]<br>[]]]                        | 0.00<br>1.00<br>0.00<br>1.00<br>0.00  | (201)<br>(202)<br>(202)<br>(204)<br>(205)   |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai   | e heat from s<br>e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 ("   | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)  | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2   | stems inclu<br>ntary syste   | nding micro<br>m (table 11        | D-CHP<br>L)                             |                                | Aur                            | (20   | 1 - (20<br>)2) x [1- (20<br>(202) x (20   | 01) =<br>03)] =<br>03) =   | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90   | (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)  |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai   | e heat from s<br>e heat from s<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 (<br>Jan  | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb   | heating sys<br>(/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar   | stems inclu<br>ntary syste<br>Apr  | nding micro<br>m (table 11<br>May | D-CHP<br>L)<br>Jun                      | Jul                            | Aug                            | (20<br>Sep  | 1 - (20<br>)2) × [1- (20<br>(202) × (20<br>Oct  | 01) =<br>03)] =<br>03) =<br>Nov  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br><b>Dec</b>   | 201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)   |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu   | e heat from s<br>e heat from r<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 ('<br>Jan<br>el (main syst   | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV                                     | heating sy:<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month                             | Apr  | May                               | Jun                                     | Jul                            | Aug                            | (20<br>Sep  | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br>Oct  | 01) =<br>)3)] =<br>03) =<br>Nov  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec  | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)  |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu   | e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 (<br>Jan<br>el (main syst<br>344.23   | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77                           | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br><b>Mar</b><br>Vh/month<br>124.62             | stems inclu<br>ntary syste<br>Apr<br>36.61   | May<br>6.87                       | D-CHP<br>L)<br>Jun<br>0.00              | <b>Jul</b>                     | <b>Aug</b>                     | (20<br>Sep  | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>55.67  | 01) =<br>03)] =<br>03) =<br>Nov<br>209.06  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>365.82  | (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)  |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu  | irements - i<br>e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 (*<br>Jan<br>el (main syst<br>344.23  | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77                           | heating sy:<br>/supplemener<br>em(s)<br>em 2<br>system 1<br>system 2<br><b>Mar</b><br>Vh/month<br>124.62          | Apr<br>36.61   | May<br>6.87                       | D-CHP                                   | <b>Jul</b><br>0.00             | <b>Aug</b>                     | (20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>55.67<br>1)15, 10                                | 01) =<br>03)] =<br>03) =<br>Nov<br>209.06<br>.12 =                                     | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br><b>Dec</b><br>365.82<br>1357.66  | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>) (206)   |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating  | irements - i<br>e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 ('<br>Jan<br>el (main syst<br>344.23  | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77                           | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62                    | Apr<br>36.61   | May<br>6.87                       | Jun 0.00                                | <b>Jul</b>                     | <b>Aug</b>                     | (20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>55.67<br>1)15, 10                                | 01) =<br>03)] =<br>03) =<br>Nov<br>209.06<br>.12 =                                     | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br><b>Dec</b><br>365.82<br>1357.66  | (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>(206)   |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat   | e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>space heat f<br>n system 1 (<br>Jan<br>el (main syst<br>344.23   | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77                           | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62                    | Apr<br>36.61   | May<br>6.87                       | Jun 0.00 87.20                          | Jul<br>0.00                    | Aug<br>0.00                    | (20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>1)15, 10   | 01) =<br>03) =<br>Nov<br>209.06<br>.12 =   | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>365.82<br>1357.66   | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>(206)   |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat   | e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 (r<br>Jan<br>el (main syst<br>344.23<br>er heater<br>89.07  | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77<br>88.86                  | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62<br>88.47           | Apr<br>36.61<br>87.85  | May<br>6.87                       | D-CHP<br>L)<br>Jun<br>0.00<br>87.30     | Jul<br>0.00<br>87.30           | Aug<br>0.00<br>87.30           | (20<br><b>Sep</b><br>0.00<br>Σ(21:<br>87.30           | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>1)15, 10<br>88.03                                | 01) =<br>03)] =<br>03) =<br>Nov<br>209.06<br>.12 =<br>88.83                            | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>365.82<br>1357.66<br>89.12  | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>) (211)   |
| <ul> <li>9a. Energy requisite</li> <li>Space heating</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of total</li> <li>Fraction of total</li> <li>Efficiency of mai</li> <li>Space heating fu</li> <li>Water heating</li> <li>Efficiency of wat</li> <li>Water heating fu</li> </ul>  | irements - i<br>e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 ('<br>Jan<br>el (main syst<br>344.23<br>er heater<br>89.07<br>iel, kWh/mo   | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77<br>88.86<br>mth           | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62<br>88.47           | Apr<br>36.61<br>87.85  | May<br>6.87<br>87.43              | D-CHP<br>Jun<br>0.00<br>87.30           | Jul<br>0.00<br>87.30           | Aug<br>0.00<br>87.30           | (20<br>Sep<br>0.00<br>Σ(21:<br>87.30                  | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br>Oct<br>55.67<br>1)15, 10<br>88.03                              | 01) =<br>(3)] =<br>(3) =<br>Nov<br>209.06<br>.12 =<br>88.83                            | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>365.82<br>1357.66<br>89.12  | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>(206)<br>(211)  |
| <ul> <li>9a. Energy requisite</li> <li>Space heating</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of total</li> <li>Fraction of total</li> <li>Efficiency of mai</li> <li>Space heating fu</li> <li>Water heating</li> <li>Efficiency of wat</li> <li>Water heating fu</li> </ul>  | e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 (r<br>Jan<br>el (main syst<br>344.23<br>er heater<br>89.07<br>rel, kWh/mo<br>159.27   | ndividual<br>secondary<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77<br>88.86<br>onth<br>140.31              | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62<br>88.47<br>88.47  | stems inclu           ntary syste           Apr           36.61           87.85           136.98 | May<br>6.87<br>87.43              | D-CHP<br>Jun<br>0.00<br>87.30<br>120.13 | Jul<br>0.00<br>87.30<br>114.49 | Aug<br>0.00<br>87.30           | (20<br>Sep<br>0.00<br>Σ(21:<br>87.30                  | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>55.67<br>1)15, 10<br>88.03<br>141.27<br>5(219-)1 | 01) =<br>03)] =<br>03) =<br>Nov<br>209.06<br>.12 =<br>88.83<br>144.82<br>12 =          | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>365.82<br>1357.66<br>89.12<br>89.12                                 | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>) (211)<br>) (211)<br>) (217)                         |
| 9a. Energy requ<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat<br>Water heating fu   | irements - i<br>e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 ('<br>Jan<br>el (main system<br>344.23<br>er heater<br>89.07<br>iel, kWh/mo<br>159.27                                     | ndividual<br>secondary<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77<br>88.86<br>onth<br>140.31              | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62<br>88.47<br>150.27 | Apr<br>36.61<br>87.85<br>136.98  | May<br>6.87<br>87.43              | D-CHP<br>Jun<br>0.00<br>87.30<br>120.13 | Jul<br>0.00<br>87.30<br>114.49 | Aug<br>0.00<br>87.30<br>126.84 | (20<br><b>Sep</b><br>0.00<br>Σ(21:<br>87.30<br>127.00 | 1 - (20<br>)2) × [1- (20<br>(202) × (20<br><b>Oct</b><br>55.67<br>1)15, 10<br>88.03<br>141.27<br>Σ(219a)1 | 01) =<br>03) =<br>Nov<br>209.06<br>.12 =<br>88.83<br>144.82<br>.12 =                   | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br><b>Dec</b><br>365.82<br>1357.66<br>89.12<br>89.12<br>154.86<br>1651.30     | ) (201)<br>(202)<br>(204)<br>(205)<br>(206)<br>(206)<br>(211)<br>(211)<br>(217)                               |
| <ul> <li>9a. Energy requisive space heating</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of total</li> <li>Fraction of total</li> <li>Efficiency of mai</li> <li>Space heating fu</li> <li>Water heating</li> <li>Efficiency of wat</li> <li>Water heating fu</li> <li>Water heating fu</li> <li>Mater heating fu</li> </ul>   | e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 (*<br>Jan<br>el (main syst<br>344.23<br>er heater<br>89.07<br>rel, kWh/mo<br>159.27   | ndividual<br>secondary<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77<br>88.86<br>onth<br>140.31              | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62<br>88.47<br>150.27 | stems inclu           ntary syste           Apr           36.61           87.85           136.98 | May<br>6.87<br>87.43              | D-CHP<br>Jun<br>0.00<br>87.30<br>120.13 | Jul<br>0.00<br>87.30<br>114.49 | Aug<br>0.00<br>87.30<br>126.84 | (20<br><b>Sep</b><br>0.00<br>Σ(21:<br>87.30<br>127.00 | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>1)15, 10<br>88.03<br>141.27<br>Σ(219a)1          | 01) =<br>03) =<br>Nov<br>209.06<br>.12 =<br>88.83<br>144.82<br>.12 =                   | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>365.82<br>1357.66<br>89.12<br>89.12<br>154.86<br>1651.30            | ) (201)<br>(202)<br>(204)<br>(205)<br>(206)<br>(206)<br>(211)<br>(211)<br>(217)<br>(219)                      |
| <ul> <li>9a. Energy requises</li> <li>Space heating</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of total</li> <li>Fraction of total</li> <li>Efficiency of mai</li> <li>Space heating fu</li> <li>Water heating</li> <li>Efficiency of wat</li> <li>Water heating fu</li> <li>Mater heating fu</li> <li>Annual totals</li> <li>Space heating fu</li> </ul>  | irements - i<br>e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 ('<br>Jan<br>el (main syst<br>344.23<br>er heater<br>89.07<br>iel, kWh/mo<br>159.27<br>el - main systel                   | ndividual<br>secondary<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77<br>88.86<br>onth<br>140.31              | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62<br>88.47<br>150.27 | stems inclu<br>ntary syste<br>Apr<br>36.61<br>87.85<br>136.98                                    | May<br>6.87<br>87.43              | D-CHP<br>Jun<br>0.00<br>87.30<br>120.13 | Jul<br>0.00<br>87.30<br>114.49 | Aug<br>0.00<br>87.30<br>126.84 | (20<br>Sep<br>0.00<br>Σ(21:<br>87.30<br>127.00        | 1 - (20<br>)2) × [1- (20<br>(202) × (20<br><b>Oct</b><br>55.67<br>1)15, 10<br>88.03<br>141.27<br>Σ(219a)1 | 01) =<br>03) =<br>03) =<br>Nov<br>209.06<br>.12 =<br>88.83<br>144.82<br>.12 =<br>.12 = | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br><b>Dec</b><br>365.82<br>1357.66<br>154.86<br>1651.30<br>1357.66<br>1651.30 | ) (201)<br>(202)<br>(204)<br>(205)<br>(206)<br>) (206)<br>) (211)<br>) (211)<br>) (217)<br>) (219)            |
| <ul> <li>9a. Energy requisive space heating</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of total</li> <li>Fraction of total</li> <li>Efficiency of mai</li> <li>Space heating fu</li> <li>Water heating fu</li> <li>Water heating fu</li> <li>Annual totals</li> <li>Space heating fu</li> <li>Water heating fu</li> <li>Water heating fu</li> <li>Water heating fu</li> <li>Water heating fu</li> </ul>  | irements - i<br>e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 ('<br>Jan<br>el (main system<br>344.23<br>er heater<br>89.07<br>iel, kWh/mo<br>159.27<br>el - main systel<br>mps, fans ar | ndividual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77<br>88.86<br>mth<br>140.31 | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62<br>88.47<br>150.27 | stems inclu<br>ntary syste<br>Apr<br>36.61<br>87.85<br>136.98                                    | May<br>6.87<br>87.43              | D-CHP<br>Jun<br>0.00<br>87.30<br>120.13 | Jul<br>0.00<br>87.30<br>114.49 | Aug<br>0.00<br>87.30<br>126.84 | (20<br>Sep<br>0.00<br>Σ(21:<br>87.30<br>127.00        | 1 - (20)<br>(202) x [1- (20)<br>(202) x (20)<br>Oct<br>55.67<br>1)15, 10<br>88.03<br>141.27<br>Σ(219a)1   | 01) =<br>03) =<br>Nov<br>209.06<br>.12 =<br>88.83<br>144.82<br>.12 =                   | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br>Dec<br>365.82<br>1357.66<br>1651.30<br>1357.66<br>1651.30                  | ) (201)<br>(202)<br>(204)<br>(205)<br>(206)<br>(206)<br>(211)<br>(211)<br>(217)<br>(219)                      |
| <ul> <li>9a. Energy requisive space heating</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of space</li> <li>Fraction of total</li> <li>Fraction of total</li> <li>Efficiency of mai</li> <li>Space heating fu</li> <li>Water heating</li> <li>Efficiency of wat</li> <li>Water heating fu</li> </ul> | e heat from s<br>e heat from r<br>e heat from r<br>space heat f<br>space heat f<br>n system 1 (r<br>Jan<br>el (main syst<br>344.23<br>er heater<br>89.07<br>iel, kWh/mo<br>159.27<br>el - main systel<br>mps, fans ar                   | ndividual<br>secondary<br>main syste<br>from main<br>from main<br>%)<br>Feb<br>tem 1), kV<br>214.77<br>88.86<br>onth<br>140.31              | heating sy:<br>/suppleme<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>124.62<br>88.47<br>150.27 | Apr<br>36.61<br>37.85<br>136.98<br>Table 4f)   | May<br>6.87<br>87.43              | D-CHP<br>Jun<br>0.00<br>87.30<br>120.13 | Jul<br>0.00<br>87.30<br>114.49 | Aug<br>0.00<br>87.30<br>126.84 | (20<br>Sep<br>0.00<br>Σ(21:<br>87.30<br>127.00        | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>55.67<br>1)15, 10<br>88.03<br>141.27<br>Σ(219a)1 | 01) =<br>03) =<br>Nov<br>209.06<br>.12 =<br>888.83<br>144.82<br>.12 =<br>.12 =         | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>89.90<br><b>Dec</b><br>365.82<br>1357.66<br>1651.30<br>1357.66                      | ) (201)<br>(202)<br>(204)<br>(205)<br>(206)<br>) (206)<br>) (211)<br>) (211)<br>) (217)<br>] (219)<br>] (219) |

| central heating pump or water pump within warm air heating                  | unit             |     | 30.00                |              |                     | (230c) |
|---|------------------|-----|----------------------|--------------|---------------------|--------|
| boiler flue fan   |                  |     | 45.00                |              |                     | (230e) |
| Total electricity for the above, kWh/year                                   |                  |     |                      |              | 153.98              | (231)  |
| Electricity for lighting (Appendix L)                                       |                  |     |                      |              | 230.99              | (232)  |
| Total delivered energy for all uses   |                  | (21 | .1)(221) + (231) + ( | 232)(237b) = | 3393.93             | (238)  |
|   |                  |     |                      |              |                     |        |
| 10a. Fuel costs - individual heating systems including micro-CH             | P                |     |                      |              |                     |        |
|   | Fuel<br>kWh/year |     | Fuel price           |              | Fuel<br>cost £/year |        |
| Space heating - main system 1   | 1357.66          | x   | 3.48                 | x 0.01 =     | 47.25               | (240)  |
| Water heating   | 1651.30          | x   | 3.48                 | x 0.01 =     | 57.47               | (247)  |
| Pumps and fans  | 153.98           | x   | 13.19                | x 0.01 =     | 20.31               | (249)  |
| Electricity for lighting  | 230.99           | x   | 13.19                | x 0.01 =     | 30.47               | (250)  |
| Additional standing charges   |                  |     |                      | [            | 120.00              | (251)  |
| Total energy cost   |                  |     | (240)(242) +         | (245)(254) = | 275.49              | (255)  |
|   |                  |     |                      |              |                     |        |
| 11a. SAP rating - individual heating systems including micro-CH             | 1P               | _   |                      |              |                     | 7      |
| Energy cost deflator (Table 12)   |                  |     |                      |              | 0.42                | (256)  |
| Energy cost factor (ECF)  |                  |     |                      |              | 1.22                | (257)  |
| SAP value   |                  |     |                      |              | 82.97               | ]      |
| SAP rating (section 13)   |                  |     |                      | [            | 83                  | (258)  |
| SAP band  |                  |     |                      |              | В                   | ]      |
|   |                  |     |                      |              |                     |        |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro | o-CHP            |     |                      |              |                     |        |

|                                 | Energy<br>kWh/year |   | Emission factor<br>kg CO₂/kWh |                   | Emissions<br>kg CO₂/year |         |
|---------------------------------|--------------------|---|-------------------------------|-------------------|--------------------------|---------|
| Space heating - main system 1   | 1357.66            | x | 0.22                          | = [               | 293.25                   | (261)   |
| Water heating                   | 1651.30            | x | 0.22                          | = [               | 356.68                   | (264)   |
| Space and water heating         |                    |   | (261) + (262) +               | (263) + (264) = [ | 649.94                   | (265)   |
| Pumps and fans                  | 153.98             | x | 0.52                          | = [               | 79.92                    | (267)   |
| Electricity for lighting        | 230.99             | x | 0.52                          | = [               | 119.88                   | (268)   |
| Total CO <sub>2</sub> , kg/year |                    |   |                               | (265)(271) = [    | 849.74                   | ] (272) |
| Dwelling CO₂ emission rate      |                    |   |                               | (272) ÷ (4) = [   | 17.06                    | (273)   |
| El value                        |                    |   |                               | [                 | 87.99                    | ]       |
| El rating (section 14)          |                    |   |                               | [                 | 88                       | ] (274) |
| El band                         |                    |   |                               | [                 | В                        | ]       |
|                                 |                    |   |                               |                   |                          |         |

#### 13a. Primary energy - individual heating systems including micro-CHP

|  | Energy<br>kWh/year |   | Primary factor  |                   | Primary Energy<br>kWh/year |       |
|--|--------------------|---|-----------------|-------------------|----------------------------|-------|
| Space heating - main system 1            | 1357.66            | x | 1.22            | ] =               | 1656.34                    | (261) |
| Water heating                            | 1651.30            | x | 1.22            | ] =               | 2014.59                    | (264) |
| Space and water heating                  |                    |   | (261) + (262) + | - (263) + (264) = | 3670.93                    | (265) |
| Pumps and fans                           | 153.98             | x | 3.07            | ] =               | 472.73                     | (267) |
| Electricity for lighting                 | 230.99             | x | 3.07            | ] =               | 709.14                     | (268) |
| Primary energy kWh/year                  |                    |   |                 |                   | 4852.80                    | (272) |
| Dwelling primary energy rate kWh/m2/year |                    |   |                 |                   | 97.45                      | (273) |

### DER Worksheet Design - Draft



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

|                         |            |                 |                     |              |           |       |             |              |          | _            |                      |             | _       |                      |       |  |
|-------------------------|------------|-----------------|---------------------|--------------|-----------|-------|-------------|--------------|----------|--------------|----------------------|-------------|---------|----------------------|-------|--|
| Assessor name           |            | Mr John Simpson |                     |              |           |       |             |              |          | Ass          | Assessor number      |             |         | 3722                 |       |  |
| Client                  |            |                 |                     |              |           |       |             |              |          | Last         | t modified           | I           | 19/:    | 11/2014              |       |  |
| Address                 |            | Unit 2.04       | Marine Ice          | es Haverst   | ock Hill, | Lon   | don, NW3    | 2BL          |          |              |                      |             |         |                      |       |  |
|                         |            |                 |                     |              |           |       |             |              |          |              |                      |             |         |                      |       |  |
| 1. Overall dwelling     | dimensi    | ions            |                     |              |           |       |             |              |          |              |                      |             |         |                      |       |  |
|                         |            |                 |                     |              |           | Aı    | rea (m²)    |              |          | Avera<br>hei | ge storey<br>ght (m) |             |         | Volume (m³           | ')    |  |
| Lowest occupied         |            |                 |                     |              |           |       | 69.20       | (1a) x       |          |              | 2.60                 | ] (2a) =    |         | 179.92               | (3a)  |  |
| Total floor area        |            | (1a)            | + (1b) + (1d        | c) + (1d)(   | (1n) = [  |       | 69.20       | (4)          |          |              |                      |             |         |                      |       |  |
| Dwelling volume         |            |                 |                     |              |           |       |             |              |          | (3a) -       | + (3b) + (3          | c) + (3d)(3 | 3n) = 🗌 | 179.92               | (5)   |  |
| 2. Ventilation rate     |            |                 |                     |              |           |       |             |              |          |              |                      |             |         |                      |       |  |
|                         |            |                 |                     |              |           |       |             |              |          |              |                      |             |         | m³ per hou           | r     |  |
| Number of chimneys      |            |                 |                     |              |           |       |             |              |          |              | 0                    | x 40 =      | . [     |                      | (6a)  |  |
| Number of open flue     | s          |                 |                     |              |           |       |             |              |          |              | 0                    | x 20 =      |         | 0                    | (6b)  |  |
| Number of intermitte    | ent fans   |                 |                     |              |           |       |             |              |          |              | 0                    | x 10 =      | : [     | 0                    | (7a)  |  |
| Number of passive ve    | ents       |                 |                     |              |           |       |             |              |          |              | 0                    | x 10 =      | : [     | 0                    | (7b)  |  |
| Number of flueless ga   | as fires   |                 |                     |              |           |       |             |              |          |              | 0                    | ] x 40 =    | : [     | 0                    | (7c)  |  |
| J                       |            |                 |                     |              |           |       |             |              |          |              |                      | -           | Ai      | ir changes p<br>hour | ber   |  |
| Infiltration due to chi | imnevs,    | flues, fans     | , PSVs              |              |           | (6a)  | + (6b) + (7 | a) + (7b) +  | (7c) =   |              | 0                    | ÷(5) =      | = [     | 0.00                 | (8)   |  |
| If a pressurisation tes | st has be  | een carried     | ,<br>l out or is ii | ntended, p   | roceed    | to (1 | 17), otherv | vise contin  | ue fron  | n (9) to     | (16)                 |             |         |                      |       |  |
| Air permeability value  | e, q50, e  | expressed       | in cubic me         | etres per h  | iour per  | squ   | are metre   | of envelop   | oe area  | 1            |                      |             |         | 3.00                 | (17)  |  |
| If based on air perme   | eability v | value, ther     | n (18) = [(17       | 7) ÷ 20] + ( | 8), othe  | rwis  | e (18) = (1 | 6)           |          |              |                      |             |         | 0.15                 | (18)  |  |
| Number of sides on v    | which th   | e dwelling      | ; is sheltere       | d            |           |       |             |              |          |              |                      |             |         | 2                    | (19)  |  |
| Shelter factor          |            |                 |                     |              |           |       |             |              |          |              | 1 -                  | [0.075 x (1 | 9)] = [ | 0.85                 | (20)  |  |
| Infiltration rate incor | porating   | g shelter fa    | actor               |              |           |       |             |              |          |              |                      | (18) x (2   | 20) =   | 0.13                 | (21)  |  |
| Infiltration rate modi  | fied for   | monthly v       | vind speed          | :            |           |       |             |              |          |              |                      |             |         |                      |       |  |
| L                       | Jan        | Feb             | Mar                 | Apr          | Ма        | у     | Jun         | Jul          | Α        | ug           | Sep                  | Oct         | Nov     | Dec                  |       |  |
| Monthly average win     | nd speed   | l from Tab      | le U2               |              |           |       |             |              |          |              |                      |             |         |                      |       |  |
| 5                       | 5.10       | 5.00            | 4.90                | 4.40         | 4.3       | 0     | 3.80        | 3.80         | 3.       | 70           | 4.00                 | 4.30        | 4.50    | 4.70                 | (22)  |  |
| Wind factor (22)m ÷ 4   | 4          |                 |                     |              |           |       |             |              |          |              |                      |             |         |                      |       |  |
| 1                       | .28        | 1.25            | 1.23                | 1.10         | 1.0       | 8     | 0.95        | 0.95         | 0.       | 93           | 1.00                 | 1.08        | 1.13    | 1.18                 | (22a) |  |
| Adjusted infiltration   | rate (allo | owing for s     | shelter and         | l wind fact  | or) (21)  | x (2  | 2a)m        |              |          |              |                      |             |         |                      |       |  |
| 0                       | 0.16       | 0.16            | 0.16                | 0.14         | 0.1       | 4     | 0.12        | 0.12         | 0.       | 12           | 0.13                 | 0.14        | 0.14    | 0.15                 | (22b) |  |
| Calculate effective ai  | r change   | e rate for t    | he applical         | ble case:    |           |       |             |              |          |              |                      |             |         |                      |       |  |
| If mechanical vent      | tilation:  | air change      | e rate throu        | ugh systen   | า         |       |             |              |          |              |                      |             |         | 0.50                 | (23a) |  |
| If balanced with h      | leat reco  | overy: effic    | ciency in %         | allowing f   | or in-us  | e fac | ctor from T | Table 4h     |          |              |                      |             |         | 79.90                | (23c) |  |
| a) If balanced med      | chanical   | ventilatio      | n with hea          | t recovery   | (MVHR     | ) (22 | 2b)m + (23  | b) x [1 - (2 | 3c) ÷ 10 | 00]          |                      |             |         |                      |       |  |
| 0                       | ).26       | 0.26            | 0.26                | 0.24         | 0.2       | 4     | 0.22        | 0.22         | 0.       | 22           | 0.23                 | 0.24        | 0.24    | 0.25                 | (24a) |  |
| Effective air change r  | ate - en   | ter (24a) c     | or (24b) or (       | (24c) or (2  | 4d) in (2 | 25)   |             | 1            |          |              |                      |             |         |                      |       |  |
| 0                       | ).26       | 0.26            | 0.26                | 0.24         | 0.2       | 4     | 0.22        | 0.22         | 0.       | 22           | 0.23                 | 0.24        | 0.24    | 0.25                 | (25)  |  |



| Element   |  |  | a  | Gross<br>irea, m <sup>2</sup>   | Openings<br>m <sup>2</sup>  | Net<br>A,  | area<br>m²  | U-value<br>W/m²K  | A x U V  | //К к-\<br>kJ  | /alue,<br>/m².K  | Ахк,<br>kJ/K  |  |
|---|--|--|--|---|---|--|---|---|--|--|--|---|--|
| Window  |  |  |  |   |   | 20.  | 05 x  | 1.33  | = 26.58  | 3  |  |   | (27)   |
| Door  |  |  |  |   |   | 2.1  | 14 x  | 1.10  | = 2.35   |  |  |   | (26)   |
| External wall   |  |  |  |   |   | 42.  | 52 x  | 0.20  | = 8.50   |  |  |   | (29a   |
| Party wall  |  |  |  |   |   | 30.  | 52 x  | 0.00  | = 0.00   |  |  |   | (32)   |
| Total area of ext   | ternal eleme   | ents ∑A, m²  | 2  |   |   | 64.  | 71  |   |  |  |  |   | (31)   |
| Fabric heat loss,   | , W/K = ∑(A  | × U)   |  |   |   |  |   |   | (2   | 6)(30) + (   | 32) =  | 37.44   | (33)   |
| Heat capacity Cr  | m = ∑(А x к)   |  |  |   |   |  |   | (28)  | (30) + (32)  | + (32a)(3  | 2e) =  | N/A   | (34)   |
| Thermal mass p  | arameter (T  | MP) in kJ/r  | m²K  |   |   |  |   |   |  |  |  | 250.00  | (35)   |
| Thermal bridges   | s: Σ(L x Ψ) ca   | alculated us   | sing Appen   | dix K   |   |  |   |   |  |  |  | 11.11   | (36)   |
| Total fabric heat   | t loss   |  |  |   |   |  |   |   |  | (33) + (   | 36) =  | 48.55   | (37)   |
|   | Jan  | Feb  | Mar  | Apr   | May   | Jun  | Jul   | Aug   | Sep  | Oct  | Nov  | Dec   |  |
| Ventilation heat  | t loss calcula   | ited month   | nly 0.33 x (2  | 25)m x (5)  |   |  |   |   |  |  |  |   |  |
|   | 15.62  | 15.43  | 15.24  | 14.29   | 14.10   | 13.16  | 13.16   | 12.97   | 13.54  | 14.10  | 14.48  | 14.86   | (38)   |
| Heat transfer co  | efficient, W   | /K (37)m +   | + (38)m  |   |   |  |   | •   |  |  |  |   | _  |
|   | 64.17  | 63.98  | 63.79  | 62.84   | 62.65   | 61.71  | 61.71   | 61.52   | 62.08  | 62.65  | 63.03  | 63.41   | 7  |
|   |  |  |  |   |   |  |   |   | Average =  | Σ(39)112   | /12 =  | 62.79   | (39)   |
| Heat loss param   | eter (HLP),  | W/m²K (39  | 9)m ÷ (4)  |   |   |  |   |   |  |  |  |   |  |
|   | 0.93   | 0.92   | 0.92   | 0.91  | 0.91  | 0.89   | 0.89  | 0.89  | 0.90   | 0.91   | 0.91   | 0.92  | 7  |
|   |  |  |  |   |   |  |   |   | Average =  | Σ(40)112   | /12 =  | 0.91  | (40)   |
| Number of days  | in month (1  | Table 1a)  |  |   |   |  |   |   |  |  |  |   |  |
|   | 31.00  | 28.00  | 31.00  | 30.00   | 31.00   | 30.00  | 31.00   | 31.00   | 30.00  | 31.00  | 30.00  | 31.00   | (40)   |
|   |  |  |  |   | · ·   |  |   |   |  |  | •  | - L   |  |
| 4. Water heati  | ng energy r  | equiremen  | it   |   |   |  |   |   |  |  |  |   | _  |
| Assumed occupa  | ancy, N  |  |  |   |   |  |   |   |  |  |  |   |  |
|   |  |  |  |   |   |  |   |   |  |  |  | 2.23  | (42)   |
| Annual average  | hot water u  | sage in litre  | es per day   | Vd,average  | = (25 x N) +  | 36   |   |   |  |  |  | 2.23<br>87.08   | (42)<br>(43)   |
| Annual average  | hot water u<br>Jan   | sage in litre<br><b>Feb</b>  | es per day<br><b>Mar</b>   | Vd,average<br><b>Apr</b>  | = (25 x N) +<br>May   | 36<br>Jun  | lut   | Aug   | Sep  | Oct  | Nov  | 2.23<br>87.08<br>Dec  | _ (42)<br>_ (43)   |
| Annual average<br>Hot water usage   | hot water u<br>Jan<br>e in litres pe   | sage in litre<br><b>Feb</b><br>r day for ea  | es per day<br><b>Mar</b><br>ach month  | Vd,average<br><b>Apr</b><br>Vd,m = fact   | = (25 x N) +<br>May<br>cor from Tabl  | 36<br><b>Jun</b><br>e 1c x (43   | Jul<br>)  | Aug   | Sep  | Oct  | Nov  | 2.23<br>87.08<br>Dec  | _ (42)<br>_ (43)   |
| Annual average<br>Hot water usage   | hot water u<br>Jan<br>e in litres pe<br>95.79  | sage in litre<br><b>Feb</b><br>r day for ea<br>92.31   | es per day<br>Mar<br>ach month<br>88.82  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34  | = (25 x N) +<br>May<br>or from Tabl   | 36<br>Jun<br>e 1c x (43<br>78.37   | Jul<br>)<br>78.37   | Aug<br>81.86  | <b>Sep</b> 85.34   | Oct<br>88.82   | Nov<br>92.31   | 2.23<br>87.08<br>Dec<br>95.79   | _ (42)<br>_ (43)   |
| Annual average<br>Hot water usage   | hot water u<br>Jan<br>e in litres pe<br>95.79  | sage in litre<br><b>Feb</b><br>r day for ea<br>92.31   | es per day<br>Mar<br>ach month<br>88.82  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34  | = (25 x N) +<br>May<br>for from Tabl<br>81.86   | 36<br>Jun<br>e 1c x (43<br>78.37   | Jul<br>)<br>78.37   | Aug<br>81.86  | Sep<br>85.34   | <b>Oct</b><br>88.82<br>Σ(44)1  | Nov<br>92.31<br>.12 =  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97  | ] (42)<br>] (43)<br>] (44)   |
| Annual average<br>Hot water usage<br>Energy content   | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate   | r used = 4.2   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m >   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34  | = (25 x N) +<br><b>May</b><br>or from Tabl<br>81.86   | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see  | Jul<br>)<br>78.37<br>Tables 1b,   | Aug<br>81.86<br>1c 1d)  | Sep<br>85.34   | <b>Oct</b><br>88.82<br>Σ(44)1  | Nov<br>92.31<br>.12 =  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97  | ] (42)<br>] (43)<br>] (44)   |
| Annual average<br>Hot water usage<br>Energy content   | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05   | sage in litre<br><b>Feb</b><br>r day for ea<br>92.31<br>r used = 4.1<br>124.24   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>4 nm x Tm/3<br>111.77   | = (25 x N) +<br>May<br>for from Tabl<br>81.86<br>8600 kWh/m<br>107.25   | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55   | Jul<br>)<br>78.37<br>Tables 1b,<br>85.76  | Aug<br>81.86<br>1c 1d)<br>98.41   | Sep<br>85.34<br>99.58  | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05  | Nov<br>92.31<br>.12 =<br>126.68  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>137.57  | ] (42)<br>] (43)<br>] (44)   |
| Annual average<br>Hot water usage<br>Energy content   | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05   | sage in litre<br><b>Feb</b><br>r day for ea<br>92.31<br>r used = 4.2<br>124.24   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>4 nm x Tm/3<br>111.77   | = (25 x N) +<br>May<br>for from Tabl<br>81.86<br>8600 kWh/m<br>107.25   | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55   | Jul<br>)<br>78.37<br>Tables 1b,<br>85.76  | Aug<br>81.86<br>1c 1d)<br>98.41   | Sep<br>85.34<br>99.58  | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =   | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12   | ] (42)<br>] (43)<br>] (44)<br>] (45)   |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss  | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s 0.15 x (45)  | sage in litre<br><b>Feb</b><br>r day for ea<br>92.31<br>r used = 4.2<br>124.24   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>4 nm x Tm/3<br>111.77   | = (25 x N) +<br>May<br>for from Tabl<br>81.86<br>8600 kWh/m<br>107.25   | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55   | Jul<br>)<br>78.37<br>Tables 1b,<br>85.76  | Aug<br>81.86<br>1c 1d)<br>98.41   | Sep<br>85.34<br>99.58  | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =   | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12   | ] (42)<br>] (43)<br>] (44)<br>] (45)   |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss  | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s 0.15 x (45)<br>21.31   | sage in litre<br><b>Feb</b><br>r day for ea<br>92.31<br>r used = 4.1<br>124.24<br>m<br>18.64   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>(nm x Tm/3<br>111.77<br>16.77   | = (25 x N) +<br>May<br>for from Tabl<br>81.86<br>8600 kWh/m<br>107.25<br>16.09  | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88  | Jul<br>78.37<br>Tables 1b,<br>85.76   | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76  | Sep<br>85.34<br>99.58<br>14.94   | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00                                  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64  | ] (42)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)   |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo  | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>5 0.15 x (45)<br>21.31<br>oss calculate  | sage in litre<br><b>Feb</b><br>r day for ea<br>92.31<br>r used = 4.2<br>124.24<br>m<br>18.64<br>ed for each  | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (55)  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77<br>5) x (41)m   | = (25 x N) +<br>May<br>or from Tabl<br>81.86<br>8600 kWh/m<br>107.25<br>16.09   | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88  | Jul<br>78.37<br>Tables 1b,<br>85.76   | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76  | Sep<br>85.34<br>99.58<br>14.94   | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00                                  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64  | ] (42)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)   |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo  | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s 0.15 x (45)<br>21.31<br>oss calculate<br>0.00  | sage in litre<br><b>Feb</b><br>r day for ea<br>92.31<br>r used = 4.1<br>124.24<br>124.24<br>18.64<br>ed for each<br>0.00   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (5:<br>0.00   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>(nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00   | = (25 x N) +<br>May<br>for from Tabl<br>81.86<br>8600 kWh/m<br>107.25<br>16.09<br>0.00  | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00  | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00  | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76  | Sep<br>85.34<br>99.58<br>14.94<br>0.00   | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00                          | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00                                    | ] (42)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)<br>] (56)   |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con   | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s 0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>itains dedica   | r day for ea         92.31         r used = 4.2         124.24         m         18.64         ed for each         0.00         ated solar s   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (52<br>0.00<br>storage or c   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>a nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W   | = (25 x N) +<br>May<br>for from Table<br>81.86<br>8600 kWh/m<br>107.25<br>16.09<br>0.00<br>/WHRS (56)n  | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00<br>n x [(47) -   | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>Vs] ÷ (47),   | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)   | Sep<br>85.34<br>99.58<br>14.94<br>0.00   | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00                          | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>137.57<br>1370.12<br>20.64<br>0.00                          | ] (42)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)<br>] (56)   |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con   | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s 0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>itains dedica   | sage in litre           Feb           r day for ea           92.31           r used = 4.1           124.24           124.24           18.64           ed for each           0.00           ated solar s           0.00   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (5)<br>0.00<br>storage or c<br>0.00   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>(nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00                                  | = (25 x N) +<br>May<br>for from Tabl<br>81.86<br>8600 kWh/m<br>107.25<br>16.09<br>16.09<br>0.00<br>/WHRS (56)n<br>0.00                                      | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00<br>n x [(47) -<br>0.00   | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>Vs] ÷ (47),<br>0.00   | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>14.76<br>else (56)<br>0.00  | Sep<br>85.34<br>99.58<br>14.94<br>0.00   | Oct<br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00<br>0.00  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00                          | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00                            | ] (42)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)<br>] (56)<br>] (57)   |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo   | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s 0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>otains dedica<br>0.00<br>oss for each   | sage in litre           Feb           r day for ea           92.31           r used = 4.2           124.24           m           18.64           ed for each           0.00           ated solar s           0.00           month fro  | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (52<br>0.00<br>storage or c<br>0.00<br>m Table 3  | Vd,average<br>Apr<br>Vd,m = fact<br>85.34<br>4 nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00  | = (25 x N) +<br>May<br>cor from Tabl<br>81.86<br>3600 kWh/m<br>107.25<br>16.09<br>0.00<br>/WHRS (56)n<br>0.00   | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00<br>n x [(47) -<br>0.00   | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>Vs] ÷ (47),<br>0.00   | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00   | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00                                       | Oct<br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00<br>0.00  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00                          | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00                            | ] (42)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)<br>] (56)<br>] (57)   |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo   | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s 0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>otains dedica<br>0.00<br>oss for each<br>0.00   | sage in litre           Feb           r day for ea           92.31           r used = 4.1           124.24           124.24           18.64           ed for each           0.00           ated solar s           0.00           month fro   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (51<br>0.00<br>ctorage or c<br>0.00<br>m Table 3<br>0.00  | Vd,average<br>Apr<br>Vd,m = fact<br>85.34<br>(nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00   | = (25 x N) +<br>May<br>for from Tabl<br>81.86<br>8600 kWh/m<br>107.25<br>16.09<br>0.00<br>/WHRS (56)n<br>0.00   | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00<br>n x [(47) -<br>0.00<br>0.00                                       | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>Vs] ÷ (47),<br>0.00<br>0.00                                 | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00                                   | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00                                       | Oct<br>888.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00<br>0.00   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00                          | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00                            | ] (42)<br>] (43)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)<br>] (56)<br>] (57)<br>] (59)                     |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e                     | hot water u<br>Jan<br>95.79<br>of hot wate<br>142.05<br>s $0.15 \times (45)$<br>21.31<br>oss calculate<br>0.00<br>ttains dedica<br>0.00<br>oss for each<br>0.00<br>cach month  | sage in litre           Feb           r day for ea           92.31           r used = 4.2           124.24           m           18.64           ed for each           0.00           ated solar s           0.00           month fro           0.00   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (52<br>0.00<br>storage or c<br>0.00<br>m Table 3<br>0.00<br>3a, 3b or 5   | Vd,average<br>Apr<br>Vd,m = fact<br>85.34<br>4 nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00<br>0.00<br>3c                          | = (25 x N) +<br>May<br>cor from Tabl<br>81.86<br>3600 kWh/m<br>107.25<br>16.09<br>0.00<br>/WHRS (56)n<br>0.00<br>0.00                                       | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00<br>n x [(47) -<br>0.00   | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>Vs] ÷ (47),<br>0.00<br>0.00                                 | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00   | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00                                       | Oct<br>$88.82$ $\Sigma(44)1$<br>116.05 $\Sigma(45)1$<br>17.41<br>0.00<br>0.00<br>0.00  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00<br>0.00                  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00<br>0.00                    | ] (42)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)<br>] (56)<br>] (57)<br>] (59)                               |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e                     | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s $0.15 \times (45)$<br>21.31<br>oss calculate<br>0.00<br>otains dedica<br>0.00<br>oss for each<br>0.00<br>each month<br>12.64                           | sage in litre           Feb           r day for ea           92.31           r used = 4.1           124.24           124.24           18.64           ed for each           0.00           ated solar s           0.00           month fro           0.00           from Table           11.42                     | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (5:<br>0.00<br>torage or co<br>0.00<br>m Table 3<br>0.00<br>23a, 3b or 3<br>12.64   | Vd,average<br>Apr<br>Vd,m = fact<br>85.34<br>(nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00<br>0.00<br>3c<br>12.23                  | = (25 x N) +<br>May<br>for from Table<br>81.86<br>8600 kWh/m<br>107.25<br>16.09<br>0.00<br>/WHRS (56)m<br>0.00<br>0.00<br>12.64                             | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00<br>n x [(47) -<br>0.00<br>0.00                                       | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>Vs] ÷ (47),<br>0.00<br>0.00<br>12.64                        | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00<br>12.64                          | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00<br>0.00<br>12.23                      | Oct         88.82         Σ(44)1         116.05         Σ(45)1         17.41         0.00         0.00         0.00         12.64                | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00<br>0.00<br>0.00          | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00<br>0.00<br>12.64           | ] (42)<br>] (43)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)<br>] (56)<br>] (57)<br>] (59)<br>] (61)           |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e<br>Total heat requi | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s $0.15 \times (45)$<br>21.31<br>oss calculate<br>0.00<br>itains dedica<br>0.00<br>oss for each<br>0.00<br>each month<br>12.64<br>ired for wate          | sage in litre           Feb           r day for ea           92.31           r used = 4.1           124.24           Im           18.64           ed for each           0.00           ated solar s           0.00           month fro           0.00           from Table           11.42           er heating of | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (5)<br>0.00<br>torage or c<br>0.00<br>om Table 3<br>0.00<br>a, 3b or 2<br>12.64<br>calculated   | Vd,average<br>Apr<br>Vd,m = fact<br>85.34<br>(nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00<br>0.00<br>3c<br>12.23<br>for each mo   | = (25 x N) +<br>May<br>for from Table<br>81.86<br>8600 kWh/m<br>107.25<br>16.09<br>0.00<br>/WHRS (56)m<br>0.00<br>0.00<br>12.64<br>onth 0.85 x (20)         | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00<br>n x [(47) -<br>0.00<br>0 x [(47) -<br>0.00<br>12.23<br>45)m + (40 | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>Vs] ÷ (47),<br>0.00<br>0.00<br>12.64<br>5)m + (57)          | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00<br>12.64<br>m + (59)m -           | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00<br>0.00<br>12.23<br>+ (61)m           | Oct         88.82         Σ(44)1         116.05         Σ(45)1         17.41         0.00         0.00         0.00         12.64                | Nov 92.31 .12 = 126.68 .12 = 19.00 0.00 0.00 0.00 12.23                            | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00<br>12.64                   | ] (42)<br>] (43)<br>] (43)<br>] (44)<br>] (44)<br>] (45)<br>] (46)<br>] (56)<br>] (57)<br>] (59)<br>] (61)           |
| Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e<br>Total heat requi | hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>s $0.15 \times (45)$<br>21.31<br>oss calculate<br>0.00<br>otains dedica<br>0.00<br>oss for each<br>0.00<br>each month<br>12.64<br>red for wate<br>154.69 | sage in litre         Feb         r day for ea         92.31         r used = 4.1         124.24         m         18.64         ed for each         0.00         ated solar s         0.00         month fro         0.00         from Table         11.42         er heating of         135.66                   | es per day<br>Mar<br>ach month<br>88.82<br>18 x Vd,m ><br>128.20<br>19.23<br>month (5:<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00<br>0.00 | Vd,average<br>Apr<br>Vd,m = fact<br>85.34<br>(nm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00<br>3c<br>12.23<br>for each mc<br>124.00 | = (25 x N) +<br>May<br>for from Table<br>81.86<br>8600 kWh/m<br>107.25<br>16.09<br>0.00<br>(WHRS (56)n<br>0.00<br>0.00<br>12.64<br>onth 0.85 x (c<br>119.89 | 36<br>Jun<br>e 1c x (43<br>78.37<br>onth (see<br>92.55<br>13.88<br>0.00<br>1 x [(47) -<br>0.00<br>0.00<br>12.23<br>45)m + (44<br>104.78      | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>Vs] ÷ (47),<br>0.00<br>0.00<br>12.64<br>5)m + (57)<br>98.40 | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00<br>12.64<br>m + (59)m -<br>111.05 | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00<br>0.00<br>12.23<br>+ (61)m<br>111.82 | Oct         88.82         Σ(44)1         116.05         Σ(45)1         17.41         0.00         0.00         0.00         12.64         128.70 | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00<br>0.00<br>0.00<br>12.23 | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00<br>0.00<br>12.64<br>150.21 | ] (42)<br>] (43)<br>] (43)<br>] (44)<br>] (45)<br>] (45)<br>] (46)<br>] (56)<br>] (57)<br>] (59)<br>] (61)<br>] (62) |

|  | 0.00  | 0.00  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00  | 0.00   | 0.00  | 0.00  | 0.00  | 0.00 (63)  |
|--|---|---|--|--|--|---|---|--|---|---|---|--|
| Output from wat  | er heater f   | or each mo  | nth (kWh/i   | month) (62   | 2)m + (63)m  | ı   |   |  |   |   |   |  |
|  | 154.69  | 135.66  | 140.84   | 124.00   | 119.89   | 104.78  | 98.40   | 111.05   | 111.82  | 128.70  | 138.92  | 150.21   |
|  |   |   |  |  |  |   |   |  |   | ∑(64)1  | 12 = 1  | .518.95 (64)   |
| Heat gains from  | water heat  | ing (kWh/m  | nonth) 0.25  | 5 × [0.85 ×  | (45)m + (61  | .)m] + 0.8 ×  | [(46)m + (  | 57)m + (59)  | m]  |   |   |  |
|  | 50.39   | 44.16   | 45.79  | 40.22  | 38.82  | 33.83   | 31.67   | 35.88  | 36.17   | 41.75   | 45.18   | 48.90 (65)   |
| 5 Internal gain  | e .   |   |  |  |  |   |   |  |   |   |   |  |
| 5. Internal gain   | lan   | Eeb   | Mar  | Apr  | May  | lun   | lul.  | Δυσ  | Sen   | Oct   | Nov   | Dec  |
| Metabolic gains  | (Table 5)   | 100   | Wiai   | Ч  | iviay  | 5411  | 501   | Aug  | Sep   | 000   | 100   | Dec  |
| Wietubolie Bullis  | 111 33  | 111 33  | 111 33   | 111 33   | 111 33   | 111 33  | 111 33  | 111 33   | 111 33  | 111 33  | 111 33  | 111 33 (66)  |
| Lighting gains (ca   | lculated in   | Appendix I  | . equation   | L9 or L9a).  | also see Ta  | ble 5   | 111.55  | 111.55   | 111.55  | 111.55  | 111.55  |  |
|  | 17 42   | 15.47   | 12 58  | 9.53   | 7 12   | 6.01  | 6.50  | 8 44   | 11 33   | 14 39   | 16.80   | 17.91 (67)   |
| Appliance gains (  |   | in Appendi  | x L. equatio   | on I 13 or I '   | 3a), also si   | Pe Table 5  | 0.50  | 0.44   | 11.55   | 14.55   | 10.00   |  |
| , ibbiiailee 9ailie (  | 195.42  | 197.45  | 192.34   | 181.46   | 167.73   | 154.82  | 146.20  | 144,17   | 149.28  | 160.16  | 173.89  | 186.80 (68)  |
| Cooking gains (ca  | alculated in  | Appendix I  | L. equation  | L15 or L15   | a). also see   | Table 5   | 1.0.10  |  | 10.20   | 100.10  | 1,0,00  |  |
| 00 (   | 34.13   | 34.13   | 34.13  | 34.13  | 34.13  | 34.13   | 34.13   | 34.13  | 34.13   | 34.13   | 34.13   | 34.13 (69)   |
| Pump and fan ga  | ins (Table !  | 5a)   |  |  |  |   |   |  |   |   |   |  |
|  | 3.00  | 3.00  | 3.00   | 3.00   | 3.00   | 3.00  | 3.00  | 3.00   | 3.00  | 3.00  | 3.00  | 3.00 (70)  |
| Losses e.g. evapo  | pration (Tal  | ble 5)  |  |  |  | I   |   |  |   |   |   |  |
|  | -89.06  | -89.06  | -89.06   | -89.06   | -89.06   | -89.06  | -89.06  | -89.06   | -89.06  | -89.06  | -89.06  | -89.06 (71)  |
| Water heating ga   | ains (Table   | 5)  |  |  |  |   |   |  |   |   |   |  |
|  | 67.73   | 65.72   | 61.54  | 55.86  | 52.18  | 46.99   | 42.57   | 48.23  | 50.24   | 56.11   | 62.75   | 65.73 (72)   |
| Total internal gai   | ins (66)m +   | + (67)m + (6  | 8)m + (69)   | m + (70)m ·  | + (71)m + (  | 72)m  |   |  |   |   |   |  |
|  | 220.07  | 228.04  | 225.07   |  |  |   |   |  |   | 200.00  |   | 220.02 (72)  |
|  | 559.97  | 338.04  | 325.87   | 306.25   | 286.43   | 267.22  | 254.67  | 260.24   | 270.25  | 290.06  | 312.84  | 329.83 (73)  |
|  | 339.97  | 338.04  | 325.87   | 306.25   | 286.43   | 267.22  | 254.67  | 260.24   | 270.25  | 290.06  | 312.84  | 329.83 (73)  |
| 6. Solar gains   | 339.97  | 338.04  | 325.87   | 306.25   | 286.43   | 267.22  | 254.67  | 260.24   | 270.25  | 290.06  | 312.84  | 329.83 (73)  |
| 6. Solar gains   | 333.37  | 338.04  | Access f<br>Table  | 306.25   | Area<br>m <sup>2</sup>   | 267.22<br>Sola  | 254.67<br>ar flux<br>//m²   | 260.24   | g<br>ific data  | 290.06<br>FF<br>specific d  | 312.84<br> ata  | Gains<br>W   |
| 6. Solar gains   | 333.37  | 338.04  | Access f<br>Table  | 306.25<br>factor<br>6d   | Area<br>m²   | 267.22<br>Sol:<br>W   | 254.67<br>ar flux<br>//m²   | 260.24<br>spec<br>or T   | g<br>ific data<br>able 6b   | FF<br>specific d<br>or Table  | 312.84  | Gains<br>W   |
| 6. Solar gains<br>SouthWest  | 333.37  | 338.04  | Access f<br>Table  | 306.25<br>factor<br>6d   | 286.43<br>Area<br>m <sup>2</sup><br>6.28   | 267.22<br>Sola<br>X   | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x   | 260.24<br>spec<br>or T<br>0.9 x (  | g<br>ific data<br>able 6b   | FF<br>specific d<br>or Table  | 312.84<br> ata<br> 6c<br>   = [   | Gains<br>W<br>92.23 (79)   |
| 6. Solar gains<br>SouthWest<br>NorthEast   | 335.57  | 338.04  | Access f<br>Table<br>0.7   | 306.25   | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77  | 267.22<br>Sola<br>X 3<br>X 1  | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x   | 260.24<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0   | g<br>ific data<br>able 6b<br>).72 x<br>).72 x   | FF<br>specific d<br>or Table<br>0.80  | 312.84<br> ata<br> 6c<br>  = [  | 329.83       (73)         Gains       W         92.23       (79)         62.02       (75)  |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa  | tts Σ(74)m  | (82)m   | Access f<br>Table<br>0.7   | 306.25   | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77  | 267.22<br>Sola<br>x 3<br>x 1  | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x   | spec<br>or T<br>0.9 x (0<br>0.9 x (0   | g<br>ific data<br>able 6b<br>).72 x<br>).72 x   | FF<br>specific d<br>or Table  | 312.84<br> ata<br>  6c<br>  =   _   | Gains<br>W<br>92.23 (79)<br>62.02 (75)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa  | tts ∑(74)m<br>154.25  | (82)m   | Access f<br>Table<br>0.7<br>0.7<br>442.40  | 306.25   | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42  | 267.22<br>Sol:<br>X 3<br>X 1<br>831.45  | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29   | spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>660.88   | <b>g</b><br><b>ific data</b><br><b>able 6b</b><br>0.72 x<br>0.72 x<br>509.90  | 290.06<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91  | 312.84<br> ata<br>  6c<br>    =  <br>  =  <br>  188.51  | Gains<br>W<br>92.23 (79)<br>62.02 (75)<br>129.58 (83)  |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte  | tts ∑(74)m<br>154.25<br>rnal and so   | (82)m<br>283.35<br>lar (73)m +  | Access f<br>Table<br>0.7<br>442.40<br>(83)m  | 306.25<br>actor<br>6d<br>7 x [<br>7 x [<br>639.87  | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42  | 267.22<br>Sola<br>X 3<br>X 1<br>831.45  | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29   | 260.24<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>660.88   | g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>509.90   | FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91  | 312.84<br> ata<br>  6c<br>  =  <br>  =  <br>  188.51  | 329.83       (73)         Gains       W         92.23       (79)         62.02       (75)         129.58       (83)  |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte  | tts ∑(74)m<br>154.25<br>rnal and so<br>494.23   | (82)m<br>283.35<br>lar (73)m +<br>621.39  | Access f<br>Table<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27   | 306.25<br><b>actor</b><br><b>6d</b><br>7 x [<br>7 x [<br>639.87<br>946.12  | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85   | 267.22<br>Sol:<br>X<br>X 3<br>X 1<br>831.45<br>1098.67  | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95                                    | 260.24<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>660.88<br>921.12   | <b>g</b><br><b>ific data</b><br><b>able 6b</b><br>0.72 x<br>0.72 x<br>509.90<br>780.15  | FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91  | 312.84  | 329.83       (73)         Gains       W         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)  |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte  | tts ∑(74)m<br>154.25<br>rnal and so<br>494.23   | (82)m<br>283.35<br>lar (73)m +<br>621.39  | Access f<br>Table<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27   | 306.25<br><b>actor</b><br><b>6d</b><br>7 x [<br>7 x [<br>639.87<br>946.12  | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85   | 267.22<br>Sol:<br>X 3<br>X 1<br>831.45<br>1098.67   | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95                                    | spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>660.88<br>921.12   | <b>g</b><br><b>ific data</b><br><b>able 6b</b><br>0.72 x<br>0.72 x<br>509.90<br>780.15  | 290.06<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91<br>617.97  | 312.84<br>lata<br>6c<br>= [<br>188.51<br>501.35   | 329.83       (73)         Gains       W         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)  |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean internative due</li> </ul>   | tts ∑(74)m<br>154.25<br>rnal and so<br>494.23<br>al tempera   | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heating   | Access f<br>Table<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>ng season)<br>the living a   | 306.25<br><b>factor</b><br><b>6d</b><br>7 x [<br>7 x [<br>639.87<br>946.12<br>area from T  | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85   | 267.22<br>Sol:<br>X<br>X<br>X<br>1<br>831.45<br>1098.67   | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95                                    | 260.24         spec         or T         0.9 x       ()         0.9 x       ()         660.88         921.12 | <b>g</b><br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>509.90<br>780.15  | FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91  | 312.84  | Gains<br>W<br>92.23 (79)<br>62.02 (75)<br>129.58 (83)<br>459.41 (84)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean interna</li> <li>Temperature dua</li> </ul>  | tts $\Sigma(74)$ m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating   | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heatin<br>g periods in<br><b>Feb</b>  | Access f<br>Table<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>ng season)<br>the living a<br>Mar  | 306.25   | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>able 9, Th1<br>May   | 267.22<br>Sol:<br>W<br>X 3<br>X 1<br>831.45<br>1098.67<br>(°C)  | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95                                    | 260.24<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>660.88<br>921.12   | g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>509.90<br>780.15   | 290.06<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91<br>617.97  | ata<br>6c<br>= [<br>] = [<br>] = [<br>]<br>188.51   | Gains<br>W<br>92.23 (79)<br>62.02 (75)<br>129.58 (83)<br>459.41 (84)<br>21.00 (85)<br>Dec  |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean interna</li> <li>Temperature dua</li> <li>Utilisation factor</li> </ul>  | tts ∑(74)m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating<br>Jan<br>for gains f   | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heating periods in<br>Feb<br>or living are  | Access f<br>Table<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>ng season)<br>the living a<br>Mar<br>ea n1 m (se   | 306.25         Factor         6d         7       x         7       x         639.87         946.12         area from T         Apr         e Table 9a)   | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>able 9, Th1<br>May   | 267.22<br>Sol:<br>X<br>X<br>X<br>X<br>1<br>831.45<br>1098.67<br>(°C)<br>Jun   | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95                                    | 260.24<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>660.88<br>921.12<br>Aug                                    | g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>509.90<br>780.15<br>Sep  | 290.06<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91<br>617.97<br>Oct   | ata<br>6c<br>=  | 329.83       (73)         Gains       (79)         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)         21.00       (85)         Dec       (73)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean interna</li> <li>Temperature dua</li> <li>Utilisation factor</li> </ul>  | tts ∑(74)m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>0.99  | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heating<br>g periods in<br>Feb<br>or living are<br>0.98   | Access f<br>Table<br>0.7<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se  | 306.25         actor         6d         7       x         7       x         639.87         946.12         area from T         Apr         e Table 9a)         0.75   | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>able 9, Th1<br>May   | 267.22<br>Sol:<br>W<br>X 3<br>X 1<br>831.45<br>1098.67<br>(°C)<br>Jun   | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95<br>Jul<br>0.26                     | 260.24<br>spec<br>or T<br>0.9 x (0)<br>0.9 x (0)<br>660.88<br>921.12<br>Aug<br>0.31                          | g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>509.90<br>780.15<br>Sep  | FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91<br>617.97<br>0ct   | 312.84  | 329.83       (73)         Gains       (79)         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)         21.00       (85)         Dec       (86)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean interna</li> <li>Temperature dua</li> <li>Utilisation factor</li> <li>Mean internal te</li> </ul>  | tts $\Sigma(74)$ m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating<br>Jan<br>for gains fo<br>0.99<br>mp of livin   | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heating<br>g periods in<br>Feb<br>or living are<br>0.98<br>g area T1 (s   | Access f<br>Table<br>0.7<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se<br>0.92<br>teps 3 to 7   | 306.25         actor         6d         7       x         7       x         639.87         946.12         area from T         Apr         e Table 9a)         0.75         in Table 9c   | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>able 9, Th1<br>May<br>0.53   | 267.22<br>Sol:<br>W<br>X 3<br>X 1<br>831.45<br>1098.67<br>(°C)<br>Jun<br>0.36   | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95<br>Jul<br>0.26                     | 260.24<br>spec<br>or T<br>0.9 x (1)<br>0.9 x (1)<br>660.88<br>921.12<br>Aug<br>0.31                          | g         ific data         able 6b         0.72       x         0.72       x         509.90         780.15         Sep         0.54  | FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91<br>617.97<br>0ct<br>0.88   | 312.84<br>lata<br>6c<br>=<br>=<br>188.51<br>501.35<br>S01.35<br>Nov                                 | 329.83       (73)         Gains       (79)         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)         21.00       (85)         Dec       (86)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - internation</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internal tee</li> </ul>   | tts ∑(74)m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>0.99<br>mp of livin<br>20.34  | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.98<br>g area T1 (s<br>20.51   | Access f<br>Table<br>0.7<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>(83)m<br>768.27<br>the living a<br>Mar<br>ea n1,m (se<br>0.92<br>teps 3 to 7<br>20.73   | 306.25<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>639.87<br>946.12<br>946.12<br>area from T<br>Apr<br>e Table 9a)<br>0.75<br>in Table 9c<br>20.90  | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>able 9, Th1<br>May<br>0.53   | 267.22<br>Sol:<br>X<br>X<br>3<br>X<br>1<br>831.45<br>1098.67<br>(°C)<br>Jun<br>0.36<br>20.96                                | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 ×<br>1.28 ×<br>786.29<br>1040.95<br>Jul<br>0.26<br>20.96            | 260.24 spec or T 0.9 x 0.9 x 660.88 921.12 Aug 0.31 20.96  | g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>509.90<br>780.15<br>Sep<br>0.54<br>20.95   | 290.06<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91<br>617.97<br>Oct<br>0.88   | 312.84<br>lata<br>6c<br>= [<br>] = [<br>188.51<br>501.35<br>501.35<br>Nov<br>0.99<br>20.55          | 329.83       (73)         Gains       (79)         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)         21.00       (85)         Dec       1.00         1.00       (86)         20.31       (87)  |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internal tee</li> <li>Temperature due</li> </ul>   | tts $\Sigma(74)$ m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating<br>Jan<br>for gains f<br>0.99<br>mp of livin<br>20.34<br>ring heating                           | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.98<br>g area T1 (s<br>20.51<br>g periods in                                   | Access f<br>Table<br>0.7<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se<br>0.92<br>teps 3 to 7<br>20.73<br>the rest of   | 306.25         actor         6d         7       ×         7       ×         639.87         946.12         area from T         Apr         e Table 9a)         0.75         in Table 9c         20.90         c dwelling fr                       | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>7able 9, Th1<br>May<br>0.53<br>c)<br>20.95<br>rom Table 9                              | 267.22<br>Sol:<br>W<br>X 3<br>X 1<br>831.45<br>1098.67<br>(°C)<br>Jun<br>0.36<br>20.96<br>0, Th2(°C)                        | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95<br>Jul<br>0.26<br>20.96            | 260.24 spec or T 0.9 x 0.9 x 0.9 x 0 660.88 921.12 Aug 0.31 20.96  | g         ific data         able 6b         0.72       x         0.72       x         509.90         780.15         Sep         0.54  | 290.06<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91<br>617.97<br>Oct<br>0.88<br>20.84  | a12.84<br>ata<br>6c<br>= [<br>] = [<br>] = [<br>] 188.51<br>501.35<br>[<br>Nov<br>0.99<br>20.55     | 329.83       (73)         Gains       (79)         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)         21.00       (85)         Dec       (86)         1.00       (86)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international term</li> <li>Temperature dur</li> <li>Utilisation factor</li> <li>Mean internal term</li> <li>Temperature dur</li> </ul>  | tts $\Sigma(74)$ m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>0.99<br>mp of livin<br>20.34<br>ring heating<br>20.14                 | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.98<br>g area T1 (s<br>20.51<br>g periods in<br>20.15                            | Access f<br>Table<br>0.7<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>(83)m<br>768.27<br>the living a<br>Mar<br>ea n1,m (se<br>0.92<br>teps 3 to 7<br>20.73<br>the rest of<br>20.15   | 306.25<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>639.87<br>946.12<br>946.12<br>area from T<br>Apr<br>e Table 9a)<br>0.75<br>in Table 9c<br>20.90<br>F dwelling fi<br>20.16  | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>able 9, Th1<br>May<br>0.53<br>c)<br>20.95<br>rom Table 9<br>20.16                      | 267.22<br>Sol:<br>W<br>3 x 3<br>x 1<br>831.45<br>1098.67<br>(°C)<br>Jun<br>0.36<br>20.96<br>9, Th2(°C)<br>20.17             | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 ×<br>1.28 ×<br>786.29<br>1040.95<br>1040.95<br>Jul<br>0.26<br>20.96 | 260.24 spec or T 0.9 x 0.9 x 6660.88 921.12 Aug 0.31 20.96 20.18   | g         ific data         able 6b         0.72       x         0.72       x         509.90         780.15         Sep         0.54         20.95                            | 290.06         FF         specific d         0.80         0.80         327.91         617.97         Oct         0.88         20.84         20.16 | 312.84<br>ata<br>6c<br>= [<br>188.51<br>501.35<br>501.35<br>Nov<br>0.99<br>20.55<br>20.16           | 329.83       (73)         Gains       (79)         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)         21.00       (85)         Dec       1.00         1.00       (86)         20.31       (87)         20.15       (88)                         |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean internal</li> <li>Temperature due</li> <li>Utilisation factor</li> <li>Mean internal tee</li> <li>Temperature due</li> <li>Utilisation factor</li> </ul> | tts $\Sigma(74)$ m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating<br>Jan<br>for gains f<br>0.99<br>mp of livin<br>20.34<br>ring heating<br>20.14<br>for gains f   | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.98<br>g area T1 (s<br>20.51<br>g periods in<br>20.15<br>or rest of dy         | Access f<br>Table<br>0.7<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>(83)m<br>768.27<br>the living a<br>Mar<br>ea n1,m (se<br>0.92<br>teps 3 to 7<br>20.73<br>the rest of<br>20.15<br>welling n2.  | 306.25         actor         6d         7       ×         7       ×         639.87         946.12         area from T         Apr         e Table 9a)         0.75         in Table 9c         20.90         dwelling fr         20.16         m | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>able 9, Th1<br>May<br>0.53<br>c)<br>20.95<br>rom Table 9<br>20.16                      | 267.22<br>Sol:<br>W<br>3 x 3<br>x 1<br>831.45<br>1098.67<br>(°C)<br>Jun<br>0.36<br>20.96<br>9, Th2(°C)<br>20.17             | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95<br>Jul<br>0.26<br>20.96<br>20.17   | 260.24<br>spec or T<br>0.9 x<br>660.88<br>921.12<br>Aug<br>0.31<br>20.96<br>20.18                            | g         ific data         able 6b         0.72       x         0.72       x         509.90         780.15         Sep         0.54         20.95         20.17              | 290.06<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>327.91<br>617.97<br>Oct<br>0.88<br>20.84<br>20.16                                       | 312.84<br>lata<br>6c<br>= [<br>] = [<br>188.51<br>501.35<br>501.35<br>Nov<br>0.99<br>20.55<br>20.16 | 329.83       (73)         Gains       (79)         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)         21.00       (85)         Dec       (86)         20.31       (87)         20.15       (88)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - internation</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internal tee</li> <li>Temperature due</li> <li>Utilisation factor</li> </ul>                | tts ∑(74)m<br>154.25<br>rnal and so<br>494.23<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>0.99<br>mp of livin<br>20.34<br>ring heating<br>20.14<br>for gains fr<br>0.99 | (82)m<br>283.35<br>lar (73)m +<br>621.39<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.98<br>g area T1 (s<br>20.51<br>g periods in<br>20.15<br>or rest of dw<br>0.97 | Access f<br>Table<br>0.7<br>0.7<br>0.7<br>442.40<br>(83)m<br>768.27<br>(83)m<br>768.27<br>(83)m<br>768.27<br>(83)m<br>768.27<br>(83)m<br>768.27<br>(93)<br>the living a<br>Mar<br>ea n1,m (se<br>0.92<br>teps 3 to 7<br>20.73<br>the rest of<br>20.15<br>welling n2,<br>0.91 | 306.25<br><b>factor</b><br><b>6d</b><br>7 x [<br>7 x [<br>639.87<br>946.12<br>946.12<br>946.12<br>area from T<br><b>Apr</b><br>e Table 9a)<br>0.75<br>in Table 9c<br>20.90<br>dwelling fi<br>20.16<br>m<br>0.71                                  | 286.43<br>Area<br>m <sup>2</sup><br>6.28<br>13.77<br>800.42<br>1086.85<br>1086.85<br>1086.85<br>1086.85<br>20.42<br>20.95<br>rom Table 9<br>20.95<br>rom Table 9 | 267.22<br>Sol:<br>X<br>X<br>3<br>X<br>1<br>831.45<br>1098.67<br>(°C)<br>Jun<br>0.36<br>20.96<br>9, Th2(°C)<br>20.17<br>0.31 | 254.67<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>786.29<br>1040.95<br>Jul<br>0.26<br>20.96<br>20.96   | 260.24 spec or T 0.9 x () 0.9 x () 660.88 921.12 Aug 0.31 20.96 20.18 0.25                                   | g         ific data         able 6b         0.72       x         0.72       x         509.90         780.15         Sep         0.54         20.95         20.17         0.48 | 290.06<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>0.80<br>327.91<br>617.97<br>0ct<br>0.88<br>20.84<br>20.16<br>0.85                       | 312.84<br>lata<br>6c<br>= [<br>188.51<br>501.35<br>501.35<br>Nov<br>0.99<br>20.55<br>20.16<br>0.98  | 329.83       (73)         Gains       (79)         92.23       (79)         62.02       (75)         129.58       (83)         459.41       (84)         21.00       (85)         Dec       (86)         1.00       (86)         20.31       (87)         20.15       (88)         1.00       (89) |

|                    | 19.26          | 19.51         | 19.81        | 20.04        | 20.09                      | 20.11     | 20.11  | 20.11  | 20.10                          | 19.98       | 19.58   | 19.22   | (90)             |
|--------------------|----------------|---------------|--------------|--------------|----------------------------|-----------|--------|--------|--------------------------------|-------------|---------|---------|------------------|
| Living area fract  | ion            |               |              |              |                            |           |        |        |                                | ving area ÷ | (4) =   | 0.37    | ) (91)           |
| Mean internal to   | emperature     | for the wh    | ole dwellin  | ρ fIA x T1 ⊣ | ⊦(1 - fl A) x <sup>-</sup> | т2        |        |        |                                | ing area i  | (.)     | 0.07    | ] (31)           |
|                    | 19.66          | 10.88         | 20.15        | 20.36        | 20.41                      | 20.43     | 20.43  | 20.43  | 20.42                          | 20.30       | 10.01   | 19.63   | (02)             |
| Apply adjustme     | nt to the me   | an interna    | 20.15        | re from Ta   | blo 10 who                 |           | iste   | 20.45  | 20.42                          | 20.30       | 19.94   | 19.05   | ] (32)           |
|                    |                | 10.72         |              | 20.21        |                            |           | 20.20  | 20.20  | 20.27                          | 20.15       | 10.70   | 10.49   | (02)             |
|                    | 19.51          | 19.75         | 20.00        | 20.21        | 20.20                      | 20.28     | 20.28  | 20.28  | 20.27                          | 20.13       | 19.79   | 19.40   | ] (55)           |
| 8. Space heating   | ng requirem    | ent           |              |              |                            |           |        |        |                                |             |         |         |                  |
|                    | Jan            | Feb           | Mar          | Apr          | May                        | Jun       | Jul    | Aug    | Sep                            | Oct         | Nov     | Dec     |                  |
| Utilisation facto  | r for gains, I | ηm            |              |              |                            |           |        |        |                                |             |         |         |                  |
|                    | 0.99           | 0.97          | 0.90         | 0.71         | 0.49                       | 0.32      | 0.22   | 0.26   | 0.49                           | 0.85        | 0.98    | 0.99    | (94)             |
| Useful gains, ηπ   | nGm, W (94     | I)m x (84)m   |              |              |                            |           |        |        |                                |             |         |         |                  |
|                    | 490.06         | 603.61        | 692.74       | 675.32       | 532.84                     | 350.07    | 226.86 | 238.54 | 380.57                         | 522.33      | 490.02  | 456.76  | (95)             |
| Monthly averag     | e external to  | emperature    | e from Tabl  | e U1         |                            |           |        |        |                                |             |         | 1       |                  |
| , 0                | 4.30           | . 4.90        | 6.50         | 8.90         | 11.70                      | 14.60     | 16.60  | 16.40  | 14.10                          | 10.60       | 7.10    | 4.20    | (96)             |
| Heat loss rate fo  | or mean inte   | ernal tempe   | erature. Lm  | . W [(39)m   | x [(93)m -                 | (96)ml    |        |        |                                |             |         |         | ] ()             |
|                    | 976.25         | 948 82        | 861 34       | 710.94       | 536.49                     | 350.27    | 226.88 | 238 58 | 383.03                         | 598 41      | 799.85  | 968 93  | (97)             |
| Space heating re   | equirement     | kWh/mon       | th $0.024 x$ | [(97)m - (9  | 5)ml x (41)                | m         | 220.00 | 230.30 | 303.03                         | 550.11      | 133.03  | 500.55  |                  |
| opuee nearing n    | 261 72         | 221.08        | 125.44       | 25.65        | 2 72                       | 0.00      | 0.00   | 0.00   | 0.00                           | 56.61       | 223.08  | 381.05  | T                |
|                    | 501.72         | 251.50        | 123.44       | 25.05        | 2.72                       | 0.00      | 0.00   | 0.00   | 5(9)                           | 8)1 5 10    | 12 = 12 | 108 25  | ]<br>] (98)      |
| Space beating r    | auiroment      | $kMh/m^2/m^2$ | oor          |              |                            |           |        |        | 2(5)                           | (08)        | ÷ (Λ)   | 20.25   | ] (90)<br>] (90) |
| Space nearing n    | equirement     |               | cui          |              |                            |           |        |        |                                | (50)        | • (+)   | 20.33   | ] (33)           |
| 9a. Energy req     | uirements -    | individual    | heating sys  | stems inclu  | iding micro                | -CHP      |        |        |                                |             |         |         |                  |
| Space heating      |                |               |              |              |                            |           |        |        |                                |             |         |         |                  |
| Fraction of spac   | e heat from    | secondary     | /suppleme    | ntary syste  | m (table 11                | .)        |        |        |                                |             |         | 0.00    | (201)            |
| Fraction of spac   | e heat from    | main syste    | em(s)        |              |                            |           |        |        |                                | 1 - (20     | 01) =   | 1.00    | (202)            |
| Fraction of spac   | e heat from    | main syste    | em 2         |              |                            |           |        |        |                                |             |         | 0.00    | (202)            |
| Fraction of total  | l space heat   | from main     | system 1     |              |                            |           |        |        | (202) x [1- (203)] = 1.00 (204 |             |         |         |                  |
| Fraction of total  | l space heat   | from main     | system 2     |              |                            |           |        |        |                                | (202) x (20 | 03) =   | 0.00    | (205)            |
| Efficiency of ma   | in system 1    | (%)           |              |              |                            |           |        |        |                                |             |         | 92.30   | (206)            |
|                    | Jan            | Feb           | Mar          | Apr          | May                        | Jun       | Jul    | Aug    | Sep                            | Oct         | Nov     | Dec     |                  |
| Space heating fu   | uel (main sy   | stem 1), kV   | Vh/month     |              |                            |           |        |        |                                |             |         |         |                  |
|                    | 391.90         | 251.34        | 135.90       | 27.79        | 2.94                       | 0.00      | 0.00   | 0.00   | 0.00                           | 61.33       | 241.69  | 412.84  | ]                |
|                    |                |               |              |              |                            |           | •      | •      | Σ <b>(21</b> )                 | 1)15, 10    | .12 = 1 | 1525.73 | (211)            |
| Water heating      |                |               |              |              |                            |           |        |        |                                |             |         |         | _                |
| Efficiency of wa   | ter heater     |               |              |              |                            |           |        |        |                                |             |         |         |                  |
|                    | 89.11          | 88.92         | 88.51        | 87.73        | 87.36                      | 87.30     | 87.30  | 87.30  | 87.30                          | 88.08       | 88.88   | 89.15   | (217)            |
| Water heating f    | uel, kWh/m     | onth          |              |              |                            |           |        |        |                                |             |         |         | _                |
|                    | 173.61         | 152.56        | 159.14       | 141.34       | 137.24                     | 120.02    | 112.71 | 127.20 | 128.08                         | 146.11      | 156.29  | 168.49  | 1                |
|                    |                | 1             |              |              |                            |           |        |        |                                | Σ(219a)1    | .12 = 1 | 1722.79 | (219)            |
| Annual totals      |                |               |              |              |                            |           |        |        |                                | ,           |         |         | _ 、 、            |
| Space heating fu   | uel - main sy  | vstem 1       |              |              |                            |           |        |        |                                |             |         | 1525.73 | 1                |
| Water heating f    | uel .          |               |              |              |                            |           |        |        |                                |             |         | 1722.79 | ]                |
| Electricity for pu | umps, fans a   | nd electric   | keep-hot (   | Table 4f)    |                            |           |        |        |                                |             | L       |         |                  |
| mechanical         | entilation f   | ans - balan   | ced. extract | or positive  | e input from               | n outside |        | 1      | 109.75                         | 1           |         |         | (230a)           |
| central heati      | ng pump or     | water num     | no within w  | arm air he   | ating unit                 |           |        |        | 30.00                          | ]           |         |         | (230c)           |
| boiler flue fa     | n              |               |              |              | 0                          |           |        |        | 45.00                          | ]           |         |         | (230e)           |
| Total electricity  | for the abov   | ve. kWh/ve    | ar           |              |                            |           |        | L      |                                | L           |         | 184.75  | (231)            |
| . eta. cicculuty   |                | ,, yc         |              |              |                            |           |        |        |                                |             |         | , _     | _ <u>, /</u>     |
10a. Fuel costs - individual heating systems including micro-CHP

(232) (238)

307.68 3740.95

|   | Fuel<br>kWh/year   |   | Fuel price                                 | Fuel<br>cost £/year                   |       |
|---|--------------------|---|--|---------------------------------------|-------|
| Space heating - main system 1   | 1525.73            | x | 3.48 x 0.01 =                              | 53.10                                 | (240) |
| Water heating   | 1722.79            | x | 3.48 x 0.01 =                              | 59.95                                 | (247) |
| Pumps and fans  | 184.75             | x | 13.19 x 0.01 =                             | 24.37                                 | (249) |
| Electricity for lighting  | 307.68             | x | 13.19 x 0.01 =                             | 40.58                                 | (250) |
| Additional standing charges   |                    |   |  | 120.00                                | (251) |
| Total energy cost   |                    |   | (240)(242) + (245)(254) =                  | 298.00                                | (255) |
| 11a. SAP rating - individual heating systems including micr             | o-CHP              |   |  |                                       |       |
| Energy cost deflator (Table 12)   |                    |   |  | 0.42                                  | (256) |
| Energy cost factor (ECF)  |                    |   |  | 1.10                                  | (257) |
| SAP value   |                    |   |  | 84.71                                 | ]     |
| SAP rating (section 13)   |                    |   |  | 85                                    | (258) |
| SAP band  |                    |   |  | В                                     | ]     |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r | nicro-CHP          |   |  |                                       |       |
|   | Energy<br>kWh/year |   | Emission factor<br>kg CO <sub>2</sub> /kWh | Emissions<br>kg CO <sub>2</sub> /year |       |
| Space heating - main system 1   | 1525.73            | x | 0.22 =                                     | 329.56                                | (261) |
| Water heating   | 1722.79            | x | 0.22 =                                     | 372.12                                | (264) |
| Space and water heating   |                    |   | (261) + (262) + (263) + (264) =            | 701.68                                | (265) |
| Pumps and fans  | 184.75             | x | 0.52 =                                     | 95.89                                 | (267) |
| Electricity for lighting  | 307.68             | x | 0.52 =                                     | 159.69                                | (268) |
| Total CO <sub>2</sub> , kg/year   |                    |   | (265)(271) =                               | 957.25                                | (272) |
| Dwelling CO <sub>2</sub> emission rate                                  |                    |   | (272) ÷ (4) =                              | 13.83                                 | (273) |
| El value  |                    |   |  | 88.77                                 | ]     |
| El rating (section 14)  |                    |   |  | 89                                    | (274) |
| El band   |                    |   |  | В                                     | ]     |
|   |                    |   |  |                                       |       |

| (261) |
|-------|
| (264) |
| (265) |
| (267) |
| (268) |
| (272) |
| (273) |
|       |



| Assessor name          |            | Mr John       | Simpson       |               |               |               |                |           | Assessor nun                | nber           | 3722  |                    |          |
|------------------------|------------|---------------|---------------|---------------|---------------|---------------|----------------|-----------|-----------------------------|----------------|-------|--------------------|----------|
| Client                 |            |               |               |               |               |               |                |           | Last modified               | ł              | 19/11 | /2014              |          |
| Address                |            | Unit 2.05     | Marine Ice    | es Haversto   | ock Hill, Lor | ndon, NW3     | 2BL            |           |                             |                |       |                    |          |
|                        |            |               |               |               |               | -             |                |           |                             |                |       |                    |          |
| 1. Overall dwelling    | g dimens   | sions         |               |               |               |               |                |           |                             |                |       |                    |          |
|                        |            |               |               |               | Α             | area (m²)     |                | A         | verage storey<br>height (m) | ,              | Vo    | lume (m³)          |          |
| Lowest occupied        |            |               |               |               |               | 78.70         | (1a) x         |           | 2.60                        | ] (2a) =       |       | 204.62             | (3a)     |
| Total floor area       |            | (1a)          | + (1b) + (1   | c) + (1d)(    | 1n) =         | 78.70         | (4)            |           |                             |                |       |                    |          |
| Dwelling volume        |            |               |               |               |               |               |                | (3        | 3a) + (3b) + (3             | sc) + (3d)(3   | n) =  | 204.62             | (5)      |
| 2. Ventilation rate    |            |               |               |               |               |               |                |           |                             |                |       |                    |          |
|                        |            |               |               |               |               |               |                |           |                             |                | m³    | ³ per hour         |          |
| Number of chimney      | /S         |               |               |               |               |               |                | Г         | 0                           | x 40 =         |       | 0                  | (6a)     |
| Number of open flu     | ies        |               |               |               |               |               |                |           | 0                           | <br>x 20 =     |       | 0                  | (6b)     |
| Number of intermit     | tent fan   | s             |               |               |               |               |                |           | 0                           | <br>x 10 =     |       | 0                  | (7a)     |
| Number of passive      | vents      |               |               |               |               |               |                |           | 0                           | <br>x 10 =     |       | 0                  | <br>(7b) |
| Number of flueless     | gas fires  |               |               |               |               |               |                |           | 0                           | <br>x 40 =     |       | 0                  | (7c)     |
|                        |            |               |               |               |               |               |                |           |                             |                | Air o | hanges pe:<br>hour | r        |
| Infiltration due to c  | himneys    | , flues, fans | s, PSVs       |               | (6a)          | ) + (6b) + (7 | 'a) + (7b) + ( | (7c) =    | 0                           | ÷ (5) =        |       | 0.00               | (8)      |
| If a pressurisation t  | est has k  | been carried  | d out or is i | ntended, p    | roceed to (   | 17), otherv   | vise continu   | e from (  | 9) to (16)                  | _              |       |                    |          |
| Air permeability val   | ue, q50,   | expressed     | in cubic m    | etres per h   | our per squ   | uare metre    | of envelop     | e area    |                             |                |       | 3.00               | (17)     |
| If based on air perm   | neability  | value, ther   | n (18) = [(17 | 7) ÷ 20] + (8 | 3), otherwi   | se (18) = (1  | .6)            |           |                             |                |       | 0.15               | (18)     |
| Number of sides on     | which t    | he dwelling   | g is sheltere | ed            |               |               |                |           |                             |                |       | 2                  | (19)     |
| Shelter factor         |            |               |               |               |               |               |                |           | 1                           | - [0.075 x (19 | 9)] = | 0.85               | (20)     |
| Infiltration rate inco | orporatir  | ng shelter f  | actor         |               |               |               |                |           |                             | (18) x (2      | .0) = | 0.13               | (21)     |
| Infiltration rate mod  | dified for | r monthly v   | wind speed    | :             |               |               |                |           |                             |                |       |                    |          |
|                        | Jan        | Feb           | Mar           | Apr           | May           | Jun           | Jul            | Aug       | Sep                         | Oct            | Nov   | Dec                |          |
| Monthly average w      | ind spee   | d from Tab    | ole U2        |               |               |               |                |           |                             |                |       |                    |          |
|                        | 5.10       | 5.00          | 4.90          | 4.40          | 4.30          | 3.80          | 3.80           | 3.70      | 4.00                        | 4.30           | 4.50  | 4.70               | (22)     |
| Wind factor (22)m +    | ÷ 4        |               |               |               |               |               |                |           |                             |                |       |                    |          |
|                        | 1.28       | 1.25          | 1.23          | 1.10          | 1.08          | 0.95          | 0.95           | 0.93      | 1.00                        | 1.08           | 1.13  | 1.18               | (22a)    |
| Adjusted infiltration  | n rate (al | lowing for    | shelter and   | l wind facto  | or) (21) x (2 | 22a)m         | _              |           |                             |                |       |                    | _        |
|                        | 0.16       | 0.16          | 0.16          | 0.14          | 0.14          | 0.12          | 0.12           | 0.12      | 0.13                        | 0.14           | 0.14  | 0.15               | (22b)    |
| Calculate effective a  | air chang  | ge rate for t | the applica   | ble case:     |               |               |                |           |                             |                |       |                    | _        |
| If mechanical ve       | ntilation  | : air chang   | e rate throu  | ugh system    |               |               |                |           |                             |                |       | 0.50               | (23a)    |
| If balanced with       | heat rec   | covery: effi  | ciency in %   | allowing fo   | or in-use fa  | ctor from T   | Fable 4h       |           |                             |                |       | 79.90              | (23c)    |
| a) If balanced m       | echanica   | al ventilatio | on with hea   | t recovery    | (MVHR) (2     | 2b)m + (23    | b) x [1 - (23  | c) ÷ 100] |                             |                |       |                    | _        |
|                        | 0.26       | 0.26          | 0.26          | 0.24          | 0.24          | 0.22          | 0.22           | 0.22      | 0.23                        | 0.24           | 0.24  | 0.25               | (24a)    |
| Effective air change   | rate - ei  | nter (24a) o  | or (24b) or   | (24c) or (24  | 1d) in (25)   |               | -1             | 1         |                             | · · · · ·      |       |                    | -        |
|                        | 0.26       | 0.26          | 0.26          | 0.24          | 0.24          | 0.22          | 0.22           | 0.22      | 0.23                        | 0.24           | 0.24  | 0.25               | (25)     |



| 3. Heat losses    | and heat lo             | ss paramet    | er:           |                  |                            |             |             |                  |             |               |                 |              |       |
|-------------------|-------------------------|---------------|---------------|------------------|----------------------------|-------------|-------------|------------------|-------------|---------------|-----------------|--------------|-------|
| Element           |                         |               | а             | Gross<br>rea, m² | Openings<br>m <sup>2</sup> | Net<br>A,   | area<br>m²  | U-value<br>W/m²K | AxUW        | //К к-\<br>kJ | value,<br>/m².K | Ахк,<br>kJ/K |       |
| Window            |                         |               |               |                  |                            | 10          | .25 x       | 1.33             | = 13.59     | Э             |                 |              | (27)  |
| Door              |                         |               |               |                  |                            | 2.          | 14 x        | 1.10             | = 2.35      |               |                 |              | (26)  |
| External wall     |                         |               |               |                  |                            | 60          | .77 x       | 0.20             | = 12.15     | 5             |                 |              | (29a) |
| Party wall        |                         |               |               |                  |                            | 32          | .47 x       | 0.00             | = 0.00      |               |                 |              | (32)  |
| Total area of ext | ternal elem             | ents ∑A, m²   | 2             |                  |                            | 73          | .16         |                  |             |               |                 |              | (31)  |
| Fabric heat loss, | , W/K = ∑(A             | × U)          |               |                  |                            |             |             |                  | (2          | 6)(30) + (    | 32) =           | 28.10        | (33)  |
| Heat capacity C   | m = ∑(А x к)            |               |               |                  |                            |             |             | (28)             | (30) + (32) | + (32a)(3     | 2e) =           | N/A          | (34)  |
| Thermal mass p    | arameter (T             | ·MP) in kJ/r  | m²K           |                  |                            |             |             |                  |             |               |                 | 250.00       | (35)  |
| Thermal bridges   | s: Σ(L x Ψ) ca          | alculated u   | sing Appen    | dix K            |                            |             |             |                  |             |               |                 | 9.59         | (36)  |
| Total fabric heat | t loss                  |               |               |                  |                            |             |             |                  |             | (33) + (      | 36) =           | 37.69        | (37)  |
|                   | Jan                     | Feb           | Mar           | Apr              | May                        | Jun         | Jul         | Aug              | Sep         | Oct           | Nov             | Dec          |       |
| Ventilation heat  | t loss calcula          | ated month    | ily 0.33 x (2 | 25)m x (5)       |                            |             |             |                  |             |               |                 |              |       |
|                   | 17.76                   | 17.55         | 17.33         | 16.26            | 16.04                      | 14.97       | 14.97       | 14.75            | 15.40       | 16.04         | 16.47           | 16.90        | (38)  |
| Heat transfer co  | oefficient, W           | //K (37)m +   | + (38)m       |                  |                            |             |             |                  |             |               |                 |              |       |
|                   | 55.45                   | 55.24         | 55.02         | 53.94            | 53.73                      | 52.65       | 52.65       | 52.44            | 53.08       | 53.73         | 54.16           | 54.59        |       |
|                   |                         |               |               |                  |                            |             |             |                  | Average =   | ∑(39)112,     | /12 =           | 53.89        | (39)  |
| Heat loss param   | eter (HLP),             | W/m²K (39     | 9)m ÷ (4)     |                  |                            |             |             |                  |             |               |                 |              |       |
|                   | 0.70                    | 0.70          | 0.70          | 0.69             | 0.68                       | 0.67        | 0.67        | 0.67             | 0.67        | 0.68          | 0.69            | 0.69         |       |
|                   |                         |               |               |                  |                            |             |             |                  | Average =   | ∑(40)112,     | /12 =           | 0.68         | (40)  |
| Number of days    | in month ( <sup>-</sup> | Table 1a)     |               |                  |                            |             |             |                  |             |               |                 |              |       |
|                   | 31.00                   | 28.00         | 31.00         | 30.00            | 31.00                      | 30.00       | 31.00       | 31.00            | 30.00       | 31.00         | 30.00           | 31.00        | (40)  |
| 4. Water heati    | ng energy r             | equiremen     | t             |                  |                            |             |             |                  |             |               |                 |              |       |
| Assumed occup     | ancy, N                 |               |               |                  |                            |             |             |                  |             |               |                 | 2.44         | (42)  |
| Annual average    | hot water u             | isage in litr | es per day    | Vd,average       | = (25 x N) +               | 36          |             |                  |             |               |                 | 92.10        | (43)  |
|                   | Jan                     | Feb           | Mar           | Apr              | May                        | Jun         | Jul         | Aug              | Sep         | Oct           | Nov             | Dec          |       |
| Hot water usage   | e in litres pe          | r day for ea  | ach month     | Vd,m = fact      | tor from Tab               | le 1c x (43 | ;)          |                  |             |               |                 |              |       |
|                   | 101.31                  | 97.62         | 93.94         | 90.25            | 86.57                      | 82.89       | 82.89       | 86.57            | 90.25       | 93.94         | 97.62           | 101.31       | 7     |
|                   |                         |               |               |                  |                            |             |             |                  |             | ∑(44)1        | .12 =           | 1105.15      | (44)  |
| Energy content    | of hot wate             | r used = 4.:  | 18 x Vd,m >   | nm x Tm/3        | 3600 kWh/m                 | onth (see   | Tables 1b,  | 1c 1d)           |             |               |                 |              |       |
|                   | 150.23                  | 131.40        | 135.59        | 118.21           | 113.42                     | 97.88       | 90.70       | 104.08           | 105.32      | 122.74        | 133.98          | 145.49       |       |
|                   |                         |               |               |                  |                            |             |             |                  |             | ∑(45)1        | .12 =           | 1449.03      | (45)  |
| Distribution loss | 5 0.15 x (45            | )m            |               |                  |                            |             |             |                  |             |               |                 |              |       |
|                   | 22.54                   | 19.71         | 20.34         | 17.73            | 17.01                      | 14.68       | 13.60       | 15.61            | 15.80       | 18.41         | 20.10           | 21.82        | (46)  |
| Water storage le  | oss calculate           | ed for each   | month (5      | 5) x (41)m       |                            |             |             |                  |             |               |                 |              |       |
|                   | 0.00                    | 0.00          | 0.00          | 0.00             | 0.00                       | 0.00        | 0.00        | 0.00             | 0.00        | 0.00          | 0.00            | 0.00         | (56)  |
| If the vessel con | itains dedica           | ated solar s  | torage or o   | ledicated W      | /WHRS (56)r                | n x [(47) - | Vs] ÷ (47), | else (56)        |             |               |                 |              |       |
|                   | 0.00                    | 0.00          | 0.00          | 0.00             | 0.00                       | 0.00        | 0.00        | 0.00             | 0.00        | 0.00          | 0.00            | 0.00         | (57)  |
| Primary circuit l | oss for each            | month fro     | m Table 3     |                  |                            |             |             |                  |             |               |                 |              |       |
|                   | 0.00                    | 0.00          | 0.00          | 0.00             | 0.00                       | 0.00        | 0.00        | 0.00             | 0.00        | 0.00          | 0.00            | 0.00         | (59)  |
| Combi loss for e  | ach month               | from Table    | 3a, 3b or 3   | Bc               |                            |             |             |                  |             |               |                 |              |       |
|                   | 12.64                   | 11.42         | 12.64         | 12.23            | 12.64                      | 12.23       | 12.64       | 12.64            | 12.23       | 12.64         | 12.23           | 12.64        | (61)  |
| Total heat requi  | red for wat             | er heating o  | calculated    | for each mo      | onth 0.85 x (              | 45)m + (4   | 6)m + (57)  | m + (59)m +      | + (61)m     |               |                 |              |       |
|                   | 162.87                  | 142.81        | 148.23        | 130.44           | 126.06                     | 110.11      | 103.34      | 116.72           | 117.55      | 135.38        | 146.21          | 158.13       | (62)  |
|                   |                         |               |               | البناء مممر      |                            |             |             |                  |             |               |                 |              |       |

|   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00   | 0.00  | 0.00   | 0.00  | 0.00  | 0.00   | 0.00   | 0.00 (63  | 3)   |
|---|---|--|---|--|--|---|--|---|---|--|--|---|--|
| Output from wat   | er heater f   | or each mo   | nth (kWh/r  | month) (62   | 2)m + (63)m  | ı   |  |   |   |  |  |   |  |
|   | 162.87  | 142.81   | 148.23  | 130.44   | 126.06   | 110.11  | 103.34   | 116.72  | 117.55  | 135.38   | 146.21   | 158.13  |  |
|   |   |  |   |  |  |   |  |   |   | ∑(64)1   | .12 =  | 1597.86 (64   | 4)   |
| Heat gains from   | water heat  | ing (kWh/m   | onth) 0.25  | 5 × [0.85 × (  | (45)m + (61  | .)m] + 0.8 ×  | [(46)m + (   | 57)m + (59)   | )m]   |  |  |   |  |
|   | 53.11   | 46.54  | 48.24   | 42.36  | 40.87  | 35.60   | 33.32  | 37.77   | 38.08   | 43.97  | 47.61  | 51.54 (65   | 5)   |
| 5. Internal gain  | s   |  |   |  |  |   |  |   |   |  |  |   |  |
|   | Jan   | Feb  | Mar   | Apr  | May  | Jun   | Jul  | Aug   | Sep   | Oct  | Nov  | Dec   |  |
| Metabolic gains   | (Table 5)   |  |   | ·  |  |   |  | .0  |   |  | _  |   |  |
| 0   | 121.89  | 121.89   | 121.89  | 121.89   | 121.89   | 121.89  | 121.89   | 121.89  | 121.89  | 121.89   | 121.89   | 121.89 (66  | 6)   |
| Lighting gains (ca  | lculated in   | Appendix L   | , equation  | L9 or L9a),  | also see Ta  | able 5  | I  |   |   | I  | 1  | · · · ·   |  |
|   | 20.46   | 18.17  | 14.78   | 11.19  | 8.36   | 7.06  | 7.63   | 9.91  | 13.31   | 16.90  | 19.72  | 21.02 (67   | 7)   |
| Appliance gains (   | calculated  | in Appendix  | ( L, equatio  | on L13 or L1   | L3a), also se  | ee Table 5  |  |   |   |  |  | <u> </u>  |  |
|   | 216.70  | 218.95   | 213.28  | 201.22   | 185.99   | 171.68  | 162.12   | 159.87  | 165.54  | 177.60   | 192.83   | 207.14 (68  | 8)   |
| Cooking gains (ca   | alculated in  | Appendix L   | , equation  | L15 or L15   | a), also see   | Table 5   |  |   | Ī   |  |  |   |  |
|   | 35.19   | 35.19  | 35.19   | 35.19  | 35.19  | 35.19   | 35.19  | 35.19   | 35.19   | 35.19  | 35.19  | 35.19 (69   | 9)   |
| Pump and fan ga   | ins (Table !  | 5a)  |   |  |  |   |  |   |   |  |  |   |  |
|   | 3.00  | 3.00   | 3.00  | 3.00   | 3.00   | 3.00  | 3.00   | 3.00  | 3.00  | 3.00   | 3.00   | 3.00 (70  | 0)   |
| Losses e.g. evapo   | oration (Tal  | ble 5)   |   |  |  |   |  |   |   |  |  |   |  |
|   | -97.51  | -97.51   | -97.51  | -97.51   | -97.51   | -97.51  | -97.51   | -97.51  | -97.51  | -97.51   | -97.51   | -97.51 (71  | 1)   |
| Water heating ga  | ains (Table   | 5)   |   |  |  |   |  |   |   |  |  |   |  |
|   | 71.39   | 69.26  | 64.84   | 58.84  | 54.94  | 49.45   | 44.78  | 50.76   | 52.88   | 59.10  | 66.12  | 69.27 <b>(72</b>  | 2)   |
| Total internal gai  | ins (66)m +   | + (67)m + (6   | 8)m + (69)ı   | m + (70)m -  | + (71)m + (7   | 72)m  |  |   |   |  |  |   |  |
|   |   |  |   |  | . , .  |   |  |   |   |  | -  |   |  |
|   | 371.11  | 368.95   | 355.47  | 333.81   | 311.86   | 290.75  | 277.09   | 283.11  | 294.29  | 316.16   | 341.24   | 360.00 (73  | 3)   |
| 6. Solar gains  | 371.11  | 368.95   | 355.47  | 333.81   | 311.86   | 290.75  | 277.09   | 283.11  | 294.29  | 316.16   | 341.24   | 360.00 (73  | 3)   |
| 6. Solar gains  | 371.11  | 368.95   | 355.47<br>Access f  | 333.81<br>actor  | 311.86   | 290.75<br>Soli  | 277.09<br>ar flux  | 283.11  | 294.29<br>g   | 316.16<br>FF   | 341.24   | 360.00 (73  | 3)   |
| 6. Solar gains  | 371.11  | 368.95   | 355.47<br>Access f<br>Table   | 333.81<br>actor<br>6d  | 311.86<br>Area<br>m <sup>2</sup>   | 290.75<br>Sola  | 277.09<br>ar flux<br>//m²  | 283.11<br>spec  | g<br>gific data   | 316.16<br>FF<br>specific c   | 341.24   | 360.00 (73<br>Gains<br>W  | 3)   |
| 6. Solar gains  | 371.11  | 368.95   | 355.47<br>Access f<br>Table   | 333.81<br>actor<br>6d  | 311.86<br>Area<br>m <sup>2</sup>   | 290.75<br>Sola<br>W   | 277.09<br>ar flux<br>//m <sup>2</sup>  | 283.11<br>spec<br>or T  | g<br>ific data<br>able 6b   | 316.16<br>FF<br>specific c<br>or Table   | 341.24<br>Jata<br>6 6 c  | 360.00 (73<br>Gains<br>W  | 3)   |
| 6. Solar gains  | 371.11  | 368.95   | 355.47<br>Access f<br>Table   | 333.81<br>actor<br>6d<br>7 x [   | 311.86<br>Area<br>m <sup>2</sup><br>6.87   | 290.75<br>Sola<br>X 3   | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x  | 283.11<br>spec<br>or T<br>0.9 x   | g<br>ific data<br>able 6b   | 316.16<br>FF<br>specific c<br>or Table   | 341.24   | 360.00 (73<br>Gains<br>W<br>100.90 (77  | 3)   |
| 6. Solar gains<br>SouthEast<br>NorthWest  | 371.11  | 368.95   | 355.47<br>Access f<br>Table<br>0.77<br>0.77   | 333.81<br>actor<br>6d<br>7 x [<br>7 x [  | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38   | 290.75<br>Sol:<br>X<br>X<br>X<br>X<br>1   | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 283.11<br>spec<br>or T<br>0.9 x   | g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x   | 316.16<br>FF<br>specific c<br>or Table<br>0.80   | 341.24   | 360.00 (73<br>Gains<br>W<br>100.90 (77<br>15.22 (81   | 3)<br>7)<br>L)   |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa   | 371.11<br>tts Σ(74)m  | 368.95   | 355.47<br>Access f<br>Table   | 333.81<br>actor<br>6d<br>7 x [<br>7 x ]  | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38   | 290.75<br>Sola<br>X 3<br>X 1  | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 283.11<br>spec<br>or T<br>0.9 x   | g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x   | 316.16<br>FF<br>specific c<br>or Table<br>0.80   | 341.24   | 360.00 (73<br>Gains<br>W<br>100.90 (77<br>15.22 (81   | 3)<br>7)<br>1)   |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa   | 371.11<br>tts Σ(74)m<br>116.12  | 368.95<br>(82)m<br>202.86  | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99   | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 3<br>383.06  | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60   | 290.75<br>Sola<br>x 3<br>x 1<br>455.39  | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28  | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26  | 294.29           g           ific data           able 6b           0.72         x           0.72         x           322.65 | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82   | 341.24   | 360.00 (73<br>Gains<br>W<br>100.90 (77<br>15.22 (81<br>98.78 (83  | 3)<br>7)<br>1)<br>3)   |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa<br>Total gains - inte   | 371.11<br>tts Σ(74)m<br>116.12<br>rnal and so   | 368.95<br>(82)m<br>202.86<br>Jar (73)m +   | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m  | 333.81<br>actor<br>6d<br>7 x<br>7 x<br>383.06  | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60   | 290.75<br>Sola<br>X 3<br>X 1<br>455.39  | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28  | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26  | <b>g</b><br><b>ific data</b><br><b>able 6b</b><br>0.72 x<br>0.72 x<br>322.65  | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82   | 341.24   | 360.00 (73<br>Gains<br>W<br>100.90 (77<br>15.22 (81<br>98.78 (83  | 3)<br>7)<br>1)<br>3)   |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa<br>Total gains - inte   | 371.11<br>tts ∑(74)m<br>116.12<br>rnal and so<br>487.23   | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80   | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45  | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 383.06<br>716.87   | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46   | 290.75<br>Sola<br>X 3<br>X 1<br>455.39<br>746.14  | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38  | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37  | 294.29         g         ific data         able 6b         0.72       x         0.72       x         322.65         616.95  | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98   | 341.24   | 360.00       (73         Gains       (71         100.90       (77         15.22       (81         98.78       (83         458.78       (84  | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> </ul>   |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa<br>Total gains - inte<br>7. Mean interna  | 371.11<br>tts ∑(74)m<br>116.12<br>rnal and so<br>487.23<br>al tempera   | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heatin   | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>ng season)  | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 383.06<br>716.87   | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46   | 290.75<br>Sol:<br>W<br>X 3<br>X 1<br>455.39<br>746.14   | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38  | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37  | 294.29         g         ific data         able 6b         0.72       x         0.72       x         322.65         616.95  | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98   | 341.24   | 360.00 (73<br>Gains<br>W<br>100.90 (77<br>15.22 (81<br>98.78 (83<br>458.78 (84  | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - internative</li> <li>7. Mean internative</li> <li>Temperature due</li> </ul>  | 371.11<br>tts ∑(74)m<br>116.12<br>rnal and so<br>487.23<br>al tempera<br>ring heating   | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heatin<br>g periods in   | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>ng season)<br>the living a  | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 7<br>383.06<br>716.87<br>area from T   | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46<br>761.46   | 290.75<br>Sola<br>X 3<br>X 1<br>455.39<br>746.14  | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38  | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37  | 294.29<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95   | 316.16<br><b>FF</b><br><b>specific c</b><br><b>or Table</b><br>0.80<br>227.82<br>543.98                      | 341.24   | 360.00 (73<br>Gains<br>W<br>100.90 (77<br>15.22 (81<br>98.78 (83<br>98.78 (84<br>458.78 (84<br>21.00 (85  | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - international gains</li></ul> | 371.11<br>tts ∑(74)m<br>116.12<br>rnal and so<br>487.23<br>al tempera<br>ring heating<br>Jan  | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heatin<br>g periods in<br>Feb  | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>ng season)<br>the living a<br>Mar   | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 7<br>383.06<br>716.87<br>area from T<br>Apr  | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46<br>761.46   | 290.75<br>Sol:<br>W<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun  | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38  | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37<br>Aug                                   | 294.29<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>Sep  | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct                                    | 341.24   | 360.00 (73<br>Gains<br>W<br>100.90 (77<br>15.22 (81<br>98.78 (83<br>98.78 (84<br>458.78 (84<br>21.00 (85<br>Dec   | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - international gains</li></ul> | 371.11<br>tts ∑(74)m<br>116.12<br>rnal and so<br>487.23<br>al tempera<br>ring heating<br>Jan<br>for gains fr  | 368.95<br>368.95<br>368.95<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heatin<br>g periods in<br>Feb<br>or living are  | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>(83)m<br>646.45<br>the living a<br>Mar<br>a n1,m (set   | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 7<br>383.06<br>716.87<br>area from T<br>Apr<br>e Table 9a)   | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46<br>761.46   | 290.75<br>Sol:<br>W<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun  | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38  | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37<br>Aug                                   | 294.29<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>Sep  | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct                                    | 341.24   | 360.00       (73         Gains       (71         100.90       (77         15.22       (81         98.78       (82         458.78       (84         21.00       (85         Dec       (85  | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean interna</li> <li>Temperature dua</li> <li>Utilisation factor</li> </ul>   | 371.11<br>tts $\Sigma(74)$ m<br>116.12<br>rnal and so<br>487.23<br>al tempera<br>ring heating<br>Jan<br>for gains fo<br>1.00  | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99   | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>(83)m<br>646.45<br>ng season)<br>the living a<br>Mar<br>a n1,m (sec<br>0.95   | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 7<br>383.06<br>716.87<br>area from T<br>Apr<br>e Table 9a)<br>0.84   | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46<br>761.46<br>761.46   | 290.75<br>Sol:<br>W<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun<br>0.45                                    | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38<br>Jul<br>0.33                             | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37<br>Aug<br>0.36                           | 294.29<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>Sep<br>0.59                                  | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct<br>0.90                            | 341.24   | 360.00       (73         Gains       (77         100.90       (77         15.22       (81         98.78       (83         458.78       (84         21.00       (85         Dec       1.00         1.00       (86  | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> <li>5)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - international gains - internation</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internal ternation</li> </ul>  | 371.11<br>371.11<br>tts ∑(74)m<br>116.12<br>rnal and so<br>487.23<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>1.00<br>mp of livin   | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (st  | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>(83)m<br>646.45<br>the living a<br>Mar<br>a n1,m (see<br>0.95<br>teps 3 to 7  | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 7<br>383.06<br>716.87<br>area from T<br>Apr<br>e Table 9a)<br>0.84<br>in Table 9c  | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46<br>761.46<br>761.46<br>761.46<br>0.65   | 290.75<br>Sol:<br>W<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun<br>0.45                                    | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38<br>Jul<br>0.33                             | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37<br>Aug<br>0.36                           | 294.29<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>Sep<br>0.59                                  | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct<br>0.90                            | 341.24   | 360.00       (73         Gains       (71         100.90       (77         15.22       (81         98.78       (83         458.78       (84         21.00       (85         Dec       (86         1.00       (86   | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> <li>5)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean internal</li> <li>Utilisation factor</li> <li>Mean internal tee</li> </ul>  | $371.11$ tts $\Sigma(74)$ m 116.12 rnal and so 487.23 al tempera ring heating Jan for gains fr 1.00 rmp of livin 20.53  | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heating periods in Feb<br>or living area<br>0.99<br>g area T1 (stage)<br>20.65   | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m              | 333.81<br>actor<br>6d<br>7 x 7<br>7 x 7<br>383.06<br>716.87<br>area from T<br>Apr<br>e Table 9a)<br>0.84<br>in Table 9c<br>20.92   | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46<br>761.46<br>761.46<br>761.46<br>761.46   | 290.75<br>Sol:<br>W<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun<br>0.45<br>20.97                           | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38<br>Jul<br>0.33<br>20.97                    | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37<br>Aug<br>0.36<br>20.97                  | 294.29<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>Sep<br>0.59<br>20.96                         | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct<br>0.90<br>20.90                   | 341.24<br>data<br>6c<br>= [<br>140.01<br>481.24<br>Nov<br>0.99<br>20.69          | 360.00       (73         Gains       (71         100.90       (77         15.22       (81         98.78       (83         458.78       (84         21.00       (85         Dec       (86         1.00       (86         20.52       (87   | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> <li>5)</li> <li>7)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - international gains</li></ul> | 371.11<br>tts $\Sigma(74)$ m<br>116.12<br>rnal and so<br>487.23<br>al tempera<br>ring heating<br>Jan<br>for gains for<br>1.00<br>mp of livin<br>20.53<br>ring heating                                 | 368.95<br>(82)m<br>202.86<br>blar (73)m +<br>571.80<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (st<br>20.65<br>g periods in                                  | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>(83)m<br>(83)m<br>646.45<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83 | 333.81<br>actor<br>6d<br>7 x<br>7 x<br>7 x<br>383.06<br>716.87<br>area from T<br>Apr<br>e Table 9a)<br>0.84<br>in Table 9c<br>20.92<br>dwelling fr   | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46<br>761.46<br>761.46<br>761.46<br>0.65<br>0.65<br>0.20.96<br>rom Table 9   | 290.75<br>Sol:<br>W<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun<br>0.45<br>20.97<br>9, Th2(°C)             | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38<br>Jul<br>0.33<br>20.97                    | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37<br>Aug<br>0.36<br>20.97                  | 294.29<br>g ific data able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>Sep<br>0.59<br>20.96                               | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct<br>0.90<br>20.90                   | 341.24   | 360.00       (73         Gains       (71         100.90       (77         15.22       (81         98.78       (83         458.78       (84         21.00       (85         Dec       (85         1.00       (86         2.0.52       (87  | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> <li>5)</li> <li>7)</li> </ul>   |
| 6. Solar gains SouthEast NorthWest Solar gains in wa Total gains - inte 7. Mean internat Temperature due Utilisation factor Mean internal tee Temperature due   | 371.11<br>tts $\Sigma(74)$ m<br>116.12<br>rnal and so<br>487.23<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>1.00<br>rmp of livin<br>20.53<br>ring heating<br>20.34                        | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heating<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (st<br>20.65<br>g periods in<br>20.34                         | 355.47<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>290.99<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>646.45<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(93)m<br>(9       | 333.81<br>actor<br>6d<br>7 x<br>7 x<br>7 x<br>383.06<br>716.87<br>383.06<br>716.87<br>area from T<br>Apr<br>e Table 9a)<br>0.84<br>in Table 9c<br>20.92<br>dwelling fr<br>20.35              | 311.86<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>449.60<br>761.46<br>761.46<br>761.46<br>761.46<br>761.46<br>761.46   | 290.75<br>Sol:<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun<br>0.45<br>20.97<br>9, Th2(°C)<br>20.37         | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38<br>Jul<br>0.33<br>20.97<br>20.37           | 283.11  spec or T 0.9 x 0.9 x 0.9 x 384.26 667.37  Aug 0.36 20.97 20.37                               | 294.29<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>616.95<br>Sep<br>0.59<br>20.96               | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct<br>0.90<br>20.90<br>20.90          | 341.24   | 360.00       (73         Gains       (71         100.90       (77         15.22       (81         98.78       (82         458.78       (84         21.00       (85         Dec       (85         1.00       (86         20.52       (87         20.35       (88   | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> <li>5)</li> <li>5)</li> <li>7)</li> <li>3)</li> </ul>                         |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - inte</li> <li>7. Mean internal</li> <li>Utilisation factor</li> <li>Mean internal te</li> <li>Temperature due</li> <li>Utilisation factor</li> </ul>  | $371.11$ tts $\Sigma(74)$ m 116.12 rnal and so 487.23 al tempera ring heating for gains fr 1.00 mp of livin 20.53 ring heating 20.34 for gains f  | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (st<br>20.65<br>g periods in<br>20.34<br>or rest of dv         | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(95)<br>the living a<br>Mar<br>a n1,m (see<br>0.95<br>teps 3 to 7<br>20.79<br>the rest of<br>20.34<br>velling n2,i  | 333.81<br>actor<br>6d<br>7 x<br>7 x<br>7 x<br>383.06<br>716.87<br>716.87<br>area from T<br>Apr<br>e Table 9a)<br>0.84<br>in Table 9c<br>20.92<br>dwelling fr<br>20.35<br>m                   | 311.86         Area         m²         6.87         3.38         449.60         761.46         761.46         able 9, Th1         May         0.65         20.96         rom Table 9         20.36               | 290.75<br>Sol:<br>W<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun<br>0.45<br>20.97<br>9, Th2(°C)<br>20.37    | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38<br>712.38<br>Jul<br>0.33<br>20.97<br>20.37 | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37<br>Aug<br>0.36<br>20.97<br>20.37         | 294.29<br>g ific data able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>Sep<br>0.59<br>20.96<br>20.36                      | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct<br>0.90<br>20.90<br>20.36          | 341.24<br>data<br>6c<br>= [<br>140.01<br>481.24<br>Nov<br>0.99<br>20.69<br>20.35 | 360.00       (73         Gains       (71         100.90       (77         15.22       (81         98.78       (83         458.78       (84         21.00       (85         Dec       (85         1.00       (86         20.52       (87         20.35       (88   | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> <li>5)</li> <li>5)</li> <li>7)</li> <li>3)</li> </ul>                         |
| 6. Solar gains SouthEast NorthWest Solar gains in wa Total gains - inte 7. Mean internat Utilisation factor Mean internal te Temperature dur Utilisation factor   | 371.11<br>tts $\Sigma(74)$ m<br>116.12<br>rnal and so<br>487.23<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>1.00<br>mp of livin<br>20.53<br>ring heating<br>20.34<br>for gains fr<br>1.00 | 368.95<br>(82)m<br>202.86<br>Jar (73)m +<br>571.80<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (st<br>20.65<br>g periods in<br>20.34<br>or rest of dw<br>0.98 | 355.47<br>Access f<br>Table<br>0.77<br>0.77<br>290.99<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>646.45<br>(83)m<br>(83)m<br>646.45<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(83)m<br>(          | 333.81<br>actor<br>6d<br>7 x<br>7 x<br>7 x<br>383.06<br>716.87<br>383.06<br>716.87<br>area from T<br>Apr<br>e Table 9a)<br>0.84<br>in Table 9c<br>20.92<br>dwelling fr<br>20.35<br>m<br>0.81 | 311.86         Area         m²         6.87         3.38         449.60         761.46         761.46         7able 9, Th1         May         0.65         20.96         rom Table 9         20.36         0.61 | 290.75<br>Sol:<br>X 3<br>X 1<br>455.39<br>746.14<br>(°C)<br>Jun<br>0.45<br>20.97<br>9, Th2(°C)<br>20.37<br>0.41 | 277.09<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>435.28<br>712.38<br>Jul<br>0.33<br>20.97<br>20.37<br>0.28   | 283.11<br>spec<br>or T<br>0.9 x<br>0.9 x<br>384.26<br>667.37<br>Aug<br>0.36<br>20.97<br>20.37<br>0.31 | 294.29<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>322.65<br>616.95<br>616.95<br>20.96<br>20.96<br>20.36            | 316.16<br>FF<br>specific c<br>or Table<br>0.80<br>227.82<br>543.98<br>Oct<br>0.90<br>20.90<br>20.90<br>20.36 | 341.24   | 360.00       (73         Gains       (71         100.90       (77         15.22       (81         98.78       (82         458.78       (84         21.00       (85         Dec       (85         1.00       (86         20.52       (87         20.35       (88         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85         1.00       (85 | <ul> <li>3)</li> <li>7)</li> <li>1)</li> <li>3)</li> <li>4)</li> <li>5)</li> <li>5)</li> <li>5)</li> <li>7)</li> <li>3)</li> <li>3)</li> <li>3)</li> </ul> |

|                                  | 19.71               | 19.87        | 20.07             | 20.25        | 20.30          | 20.32      | 20.32  | 20.32         | 20.31  | 20.23       | 19.95               | 19.69        | (90)               |
|----------------------------------|---------------------|--------------|-------------------|--------------|----------------|------------|--------|---------------|--------|-------------|---------------------|--------------|--------------------|
| Living area fract                | ion                 |              |                   |              |                |            |        |               | Liv    | /ing area ÷ | (4) =               | 0.44         | (91)               |
| Mean internal te                 | emperature          | for the wh   | ole dwellin       | g fLA x T1 - | +(1 - fLA) x T | 2          |        |               |        | U           | .,                  |              |                    |
|                                  | 20.07               | 20.21        | 20.39             | 20.54        | 20.59          | 20.60      | 20.60  | 20.60         | 20.60  | 20.52       | 20.28               | 20.05        | (92)               |
| Apply adjustmer                  | nt to the me        | an internal  | temperatu         | ire from Ta  | ble 4e whe     | re appropr | iate   | II            |        |             |                     |              |                    |
| ,                                | 19.92               | 20.06        | . 20.24           | 20.39        | 20.44          | 20.45      | 20.45  | 20.45         | 20.45  | 20.37       | 20.13               | 19.90        | (93)               |
|                                  |                     |              | -                 |              | -              |            |        |               |        |             |                     |              | ] ( /              |
| 8. Space heatir                  | ıg requirem         | ent          |                   |              |                |            |        |               |        |             |                     |              |                    |
|                                  | Jan                 | Feb          | Mar               | Apr          | May            | Jun        | Jul    | Aug           | Sep    | Oct         | Nov                 | Dec          |                    |
| Utilisation factor               | r for gains, r      | յՠ           |                   |              |                |            |        |               |        |             |                     |              |                    |
|                                  | 0.99                | 0.98         | 0.94              | 0.81         | 0.61           | 0.41       | 0.28   | 0.32          | 0.54   | 0.87        | 0.98                | 1.00         | (94)               |
| Useful gains, ηm                 | iGm, W (94          | )m x (84)m   |                   |              |                |            |        |               |        |             |                     |              |                    |
|                                  | 484.48              | 561.42       | 608.04            | 582.15       | 465.26         | 307.94     | 202.80 | 212.53        | 335.59 | 473.18      | 472.99              | 457.01       | (95)               |
| Monthly average                  | e external te       | emperature   | e from Tabl       | e U1         |                |            |        |               |        |             |                     |              |                    |
|                                  | 4.30                | 4.90         | 6.50              | 8.90         | 11.70          | 14.60      | 16.60  | 16.40         | 14.10  | 10.60       | 7.10                | 4.20         | (96)               |
| Heat loss rate fo                | r mean inte         | rnal tempe   | rature, Lm        | , W [(39)m   | ı x [(93)m -   | (96)m]     |        |               |        |             |                     |              |                    |
|                                  | 866.15              | 837.50       | 755.76            | 619.89       | 469.50         | 308.10     | 202.81 | 212.55        | 336.91 | 525.08      | 705.51              | 857.12       | (97)               |
| Space heating re                 | quirement,          | kWh/mon      | th 0.024 x        | [(97)m - (9  | 5)m] x (41)ı   | m          |        |               |        |             |                     |              |                    |
|                                  | 283.97              | 185.52       | 109.90            | 27.18        | 3.15           | 0.00       | 0.00   | 0.00          | 0.00   | 38.61       | 167.41              | 297.68       |                    |
|                                  |                     |              |                   |              |                |            |        |               | ∑(98   | 3)15, 10    | .12 =               | 1113.43      | (98)               |
| Space heating re                 | quirement           | kWh/m²/ye    | ear               |              |                |            |        |               |        | (98)        | ÷ (4)               | 14.15        | (99)               |
| 02 Eporgy rogy                   | viromonts           | individual   | hosting sy        | toms inclu   | uding micro    | СНВ        |        |               |        |             |                     |              |                    |
| Sa. Ellergy requ                 | inements -          | Individual   | neating sys       | stems men    |                | -CHP       |        |               |        |             |                     |              |                    |
| Space nearing                    | hoot from           | cocordom     | launnlama         |              | m /tabla 11    | ,          |        |               |        |             | <b></b>             | 0.00         | (201)              |
| Fraction of space                | e neat from         | secondary,   | (supplementer)    | itary syste  | in (table II   | )          |        |               |        | 1 (2)       | 01) - [             | 1.00         | (201)              |
| Fraction of space                | e neat from         | main syste   | m 2               |              |                |            |        |               |        | 1 - (20     | JI) =               | 1.00         | ] (202)<br>] (202) |
| Fraction of total                |                     | from main    | ustom 1           |              |                |            |        |               | (20    | 2) y [1 /20 | 2)] - [             | 1.00         | (202)<br>(204)     |
| Fraction of total                | space heat          | from moin    | system 1          |              |                |            |        |               | (20    | (202) × (20 | 2)] – [[<br> 2) – [ | 1.00         | (204)              |
| Efficiency of mai                | space near          | (%)          | system 2          |              |                |            |        |               |        | (202) X (20 | J3) =               | 0.00         | (205)              |
| Efficiency of ma                 | lan                 | (%)<br>Eab   | Mar               | Apr          | May            | lun        |        | <b>A</b> .u.a | Son    | Oct         |                     | 92.30<br>Dec | (206)              |
| Space beating fu                 | Jan<br>Jan (main sy |              | Ividi<br>/h/month | Арі          | ividy          | Jun        | Jui    | Aug           | Seh    | 001         | NOV                 | Dec          |                    |
| space neating it                 |                     | 201.00       | 110.07            | 20.44        | 2.42           | 0.00       | 0.00   | 0.00          | 0.00   | 41.04       | 101 20              | 222 52       | Т                  |
|                                  | 307.65              | 201.00       | 119.07            | 29.44        | 3.42           | 0.00       | 0.00   | 0.00          | 0.00   | 41.84       | 181.38              | 322.52       |                    |
|                                  |                     |              |                   |              |                |            |        |               | 2(21)  | .)15, 10    | .12 =               | 1206.31      | _ (211)            |
| Water neating                    | or bootor           |              |                   |              |                |            |        |               |        |             |                     |              |                    |
| Efficiency of wat                |                     | 00.75        | 00.20             | 07.74        | 07.00          | 07.20      | 07.00  | 07.20         | 07.20  | 07.00       | 00.07               | 00.00        | (247)              |
| Motor booting f                  | 88.93               | 88.75        | 88.39             | 87.74        | 87.30          | 87.30      | 87.30  | 87.30         | 87.30  | 87.80       | 88.67               | 88.98        | _ (217)            |
| water neating n                  |                     |              | 167 70            | 140.07       | 144.20         | 126 12     | 110.27 | 122 70        | 124.05 | 154.00      | 164.00              | 177 70       | 7                  |
|                                  | 183.14              | 160.91       | 167.70            | 148.67       | 144.30         | 126.13     | 118.37 | 133.70        | 134.65 | 154.08      | 164.90              | 1/7.72       |                    |
|                                  |                     |              |                   |              |                |            |        |               |        | ∑(219a)1    | .12 =               | 1814.27      | (219)              |
| Annual totals                    |                     |              |                   |              |                |            |        |               |        |             |                     | 1206.24      | Ъ                  |
| Space neating fu                 | iei - main sy       | stem 1       |                   |              |                |            |        |               |        |             |                     | 1206.31      |                    |
| vvater neating fi                | uel                 | nd alacteri- | koon hat /        | Table 11     |                |            |        |               |        |             |                     | 1814.27      |                    |
| Electricity for pu               | mps, rans a         |              | keep-not (        | i abie 4T)   | to an est f    |            |        | -             | 24.02  | I           |                     |              | (220.)             |
| mechanical v                     | entilation fa       | ans - balanc | eu, extract       | or positive  | e input from   | i outside  |        |               | .24.82 |             |                     |              | (230a)             |
| central heating                  | ng pump or          | water pum    | ip within w       | arm air hea  | ating unit     |            |        |               | 30.00  |             |                     |              | (230C)             |
| poller flue fa                   | n                   |              |                   |              |                |            |        |               | 15 00  |             |                     |              | 1730e)             |
| <b>T</b> - 4 - 1 - 1 - 1 - 1 - 1 | (                   |              |                   |              |                |            |        |               | +3.00  |             | Г <b>—</b> —        | 100.00       |                    |

(232)

361.25

3581.65

| 10a. Fuel costs - individual heating systems including micro   | D-CHP   |                       |   |   |  |   |
|--|---|-----------------------|---|---|--|---|
|  | Fuel<br>kWh/year  |                       | Fuel price  |   | Fuel<br>cost £/year  |   |
| Space heating - main system 1  | 1206.31   | x                     | 3.48  | x 0.01 =  | 41.98  | (240)   |
| Water heating  | 1814.27   | x                     | 3.48  | x 0.01 =  | 63.14  | (247)   |
| Pumps and fans   | 199.82  | x                     | 13.19   | x 0.01 =  | 26.36  | (249)   |
| Electricity for lighting   | 361.25  | x                     | 13.19   | x 0.01 =  | 47.65  | (250)   |
| Additional standing charges  |   |                       |   |   | 120.00   | (251)   |
| Total energy cost  |   |                       | (240)(242) +  | (245)(254) =  | 299.12   | ] <b>(2</b> 55)   |
| 11a. SAP rating - individual heating systems including micr  | o-CHP   |                       |   |   |  |   |
| Energy cost deflator (Table 12)  |   |                       |   |   | 0.42   | (256)   |
| Energy cost factor (ECF)   |   |                       |   |   | 1.02   | (257)   |
| SAP value  |   |                       |   |   | 85.83  | ]   |
| SAP rating (section 13)  |   |                       |   |   | 86   | (258)   |
| SAP band   |   |                       |   |   | В  | ]   |
|  |   |                       |   |   |  |   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r  | micro-CHP   |                       |   |   |  |   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r  | nicro-CHP<br>Energy<br>kWh/year   |                       | Emission factor<br>kg CO2/kWh   |   | Emissions<br>kg CO₂/year   |   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1   | nicro-CHP<br>Energy<br>kWh/year<br>1206.31  | x                     | Emission factor<br>kg CO <sub>2</sub> /kWh  | =   | Emissions<br>kg CO <sub>2</sub> /year<br>260.56  | ] (261)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating  | nicro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27                               | x<br>x                | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22                                    | =   | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88  | ) (261)<br>(264)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating   | nicro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27                               | x<br>x                | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +                 | =  <br>=  <br>(263) + (264) =   | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88<br>652.45  | ] (261)<br>] (264)<br>] (265)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans   | micro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27<br>199.82                     | x<br>x<br>x           | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52         | =  <br>=  <br>(263) + (264) =  <br>=                                      | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88<br>652.45<br>103.71  | ] (261)<br>] (264)<br>] (265)<br>] (267)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting   | micro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27<br>199.82<br>361.25           | x<br>x<br>x<br>x<br>x | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52 | =  <br>=  <br>(263) + (264) =  <br>=  <br>=                               | Emissions<br>kg CO₂/year<br>260.56<br>391.88<br>652.45<br>103.71<br>187.49   | ) (261)<br>) (264)<br>] (265)<br>] (267)<br>] (268)                                 |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year  | micro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27<br>199.82<br>361.25           | x<br>x<br>x<br>x      | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52 | =  <br>=  <br>(263) + (264) =  <br>=  <br>=  <br>(265)(271) =             | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88<br>652.45<br>103.71<br>187.49<br>943.64                              | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)                      |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate  | micro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27<br>199.82<br>361.25           | x<br>x<br>x<br>x      | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52         | =  <br>=  <br>(263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) = | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88<br>652.45<br>103.71<br>187.49<br>943.64<br>11.99                     | ] (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)                       |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value  | micro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27<br>199.82<br>361.25           | x<br>x<br>x<br>x      | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52 | =  <br>=  <br>(263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) = | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88<br>652.45<br>103.71<br>187.49<br>943.64<br>11.99<br>89.78            | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)           |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)  | micro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27<br>199.82<br>361.25           | x<br>x<br>x<br>x      | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52         | =<br>(263) + (264) =<br>=<br>(265)(271) =<br>(272) ÷ (4) =                | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88<br>652.45<br>103.71<br>187.49<br>943.64<br>11.99<br>89.78<br>90      | ) (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>(273)              |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band   | micro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27<br>199.82<br>361.25           | x<br>x<br>x<br>x      | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52 | =  <br>=  <br>(263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) = | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88<br>652.45<br>103.71<br>187.49<br>943.64<br>11.99<br>89.78<br>90<br>B | ] (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>] (273)<br>] (274) |
| 12a. CO <sub>2</sub> emissions - individual heating systems including r<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band<br>13a. Primary energy - individual heating systems including | micro-CHP<br>Energy<br>kWh/year<br>1206.31<br>1814.27<br>199.82<br>361.25<br>361.25 | x<br>x<br>x<br>x      | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52 | =  <br>=  <br>(263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) = | Emissions<br>kg CO <sub>2</sub> /year<br>260.56<br>391.88<br>652.45<br>103.71<br>187.49<br>943.64<br>11.99<br>89.78<br>90<br>B | ) (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>(273)<br>(274)     |

|  | Energy<br>kWh/year |   | Primary factor  |                 | Primary Energy<br>kWh/year | ,     |
|--|--------------------|---|-----------------|-----------------|----------------------------|-------|
| Space heating - main system 1            | 1206.31            | x | 1.22            | =               | 1471.70                    | (261) |
| Water heating                            | 1814.27            | x | 1.22            | =               | 2213.41                    | (264) |
| Space and water heating                  |                    |   | (261) + (262) + | (263) + (264) = | 3685.11                    | (265) |
| Pumps and fans                           | 199.82             | x | 3.07            | =               | 613.44                     | (267) |
| Electricity for lighting                 | 361.25             | x | 3.07            | =               | 1109.03                    | (268) |
| Primary energy kWh/year                  |                    |   |                 |                 | 5407.59                    | (272) |
| Dwelling primary energy rate kWh/m2/year |                    |   |                 |                 | 68.71                      | (273) |
|  |                    |   |                 |                 |                            |       |



| Assessor name              | Mr John           | Simpson        |               |               |               |                |           | Assessor nun                | nber           | 3722  |                       |          |
|----------------------------|-------------------|----------------|---------------|---------------|---------------|----------------|-----------|-----------------------------|----------------|-------|-----------------------|----------|
| Client                     |                   |                |               |               |               |                |           | Last modified               | ł              | 19/11 | /2014                 |          |
| Address                    | Unit 3.0          | 5 Marine Ice   | es Haversto   | ock Hill, Loi | ndon, NW3     | 2BL            |           |                             |                |       |                       |          |
|                            |                   |                |               |               |               |                |           |                             |                |       |                       |          |
| 1. Overall dwelling di     | mensions          |                |               |               |               |                |           |                             |                |       |                       |          |
|                            |                   |                |               | Д             | Area (m²)     |                | А         | verage storey<br>height (m) | ,              | Vo    | lume (m³)             |          |
| Lowest occupied            |                   |                |               |               | 106.40        | (1a) x         | Ē         | 2.60                        | ] (2a) =       |       | 276.64                | (3a)     |
| Total floor area           | (1a               | ) + (1b) + (1  | c) + (1d)(    | 1n) =         | 106.40        | (4)            |           |                             |                |       |                       |          |
| Dwelling volume            |                   |                |               |               |               |                | (         | 3a) + (3b) + (3             | sc) + (3d)(3   | n) =  | 276.64                | (5)      |
| 2. Ventilation rate        |                   |                |               |               |               |                |           |                             | _              |       |                       |          |
|                            |                   |                |               |               |               |                |           |                             |                | mª    | <sup>,</sup> per hour |          |
| Number of chimneys         |                   |                |               |               |               |                | Г         | 0                           | ] × 40 -       |       |                       | (62)     |
| Number of open flues       |                   |                |               |               |               |                |           | 0                           | <br>x 20 =     |       |                       | ] (6b)   |
| Number of intermitten      | t fans            |                |               |               |               |                |           | 0                           | x 10 =         |       |                       | (00)     |
| Number of passive ven      | ts                |                |               |               |               |                |           | 0                           | x 10 =         |       |                       | ] (7u)   |
| Number of flueless gas     | fires             |                |               |               |               |                |           | 0                           | x 40 =         |       |                       | (7c)     |
|                            |                   |                |               |               |               |                |           |                             |                | Air c | hanges pe             | (, c)    |
|                            |                   |                |               |               |               |                |           |                             |                |       | hour                  |          |
| Infiltration due to chim   | ineys, flues, far | ns, PSVs       |               | (6a)          | ) + (6b) + (7 | 'a) + (7b) + ( | (7c) =    | 0                           | ÷(5) =         |       | 0.00                  | (8)      |
| If a pressurisation test   | has been carrie   | ed out or is i | ntended, pi   | roceed to (   | (17), otherv  | vise continu   | ie from ( | 9) to (16)                  |                |       |                       |          |
| Air permeability value,    | q50, expressed    | d in cubic m   | etres per h   | our per sq    | uare metre    | of envelop     | e area    |                             |                |       | 3.00                  | (17)     |
| If based on air permea     | bility value, the | en (18) = [(1  | 7) ÷ 20] + (8 | 3), otherwi   | se (18) = (1  | .6)            |           |                             |                |       | 0.15                  | (18)     |
| Number of sides on wh      | nich the dwellir  | ig is sheltere | ed            |               |               |                |           |                             |                |       | 2                     | (19)     |
| Shelter factor             |                   |                |               |               |               |                |           | 1                           | - [0.075 x (19 | 9)] = | 0.85                  | (20)     |
| Infiltration rate incorpo  | orating shelter   | factor         |               |               |               |                |           |                             | (18) x (2      | 0) =  | 0.13                  | (21)     |
| Infiltration rate modified | ed for monthly    | wind speed     | :             |               |               |                |           |                             |                |       |                       |          |
| Ja                         | n Feb             | Mar            | Apr           | May           | Jun           | Jul            | Aug       | Sep                         | Oct            | Nov   | Dec                   |          |
| Monthly average wind       | speed from Ta     | ble U2         |               |               |               | _              |           |                             |                |       |                       | _        |
| 5.1                        | .0 5.00           | 4.90           | 4.40          | 4.30          | 3.80          | 3.80           | 3.70      | 4.00                        | 4.30           | 4.50  | 4.70                  | (22)     |
| Wind factor (22)m ÷ 4      |                   |                |               |               |               |                |           |                             | · · · · · ·    |       |                       | _        |
| 1.2                        | .8 1.25           | 1.23           | 1.10          | 1.08          | 0.95          | 0.95           | 0.93      | 1.00                        | 1.08           | 1.13  | 1.18                  | (22a)    |
| Adjusted infiltration ra   | te (allowing for  | r shelter and  | l wind facto  | or) (21) x (2 | 22a)m         | _              |           |                             |                |       |                       | _        |
| 0.1                        | .6 0.16           | 0.16           | 0.14          | 0.14          | 0.12          | 0.12           | 0.12      | 0.13                        | 0.14           | 0.14  | 0.15                  | (22b)    |
| Calculate effective air o  | change rate for   | the applica    | ble case:     |               |               |                |           |                             |                |       |                       | <b>-</b> |
| If mechanical ventil       | ation: air chang  | ge rate thro   | ugh system    |               |               |                |           |                             |                |       | 0.50                  | (23a)    |
| If balanced with hea       | at recovery: eff  | iciency in %   | allowing fo   | or in-use fa  | actor from T  | Fable 4h       | 1         |                             |                |       | 79.90                 | (23c)    |
| a) If balanced mech        | anıcal ventilati  | on with hea    | t recovery    | (IVIVHR) (2   | ∠ɒ)m + (23    | 23) - 1] x (a  | c) ÷ 100  | ]                           |                |       |                       |          |
|                            | <u>16   0.26</u>  | 0.26           | 0.24          | 0.24          | 0.22          | 0.22           | 0.22      | 0.23                        | 0.24           | 0.24  | 0.25                  | (24a)    |
| Effective air change rat   | e - enter (24a)   | or (24b) or    | (24c) or (22  | ia) in (25)   | 0.00          | 0.00           |           |                             |                |       |                       | 7 (2-)   |
| 0.2                        | 0.26              | 0.26           | 0.24          | 0.24          | 0.22          | 0.22           | 0.22      | 0.23                        | 0.24           | 0.24  | 0.25                  | (25)     |



| 3. Heat losses a  | and heat lo         | ss paramet              | er:                                   |                   |                            |                 |                |                  |                                       |                           |                 |              |                  |
|-------------------|---------------------|-------------------------|---------------------------------------|-------------------|----------------------------|-----------------|----------------|------------------|---------------------------------------|---------------------------|-----------------|--------------|------------------|
| Element           |                     |                         | а                                     | Gross<br>irea, m² | Openings<br>m <sup>2</sup> | i Net<br>Aj     | t area<br>, m² | U-value<br>W/m²K | A x U V                               | V/К к- <sup>,</sup><br>kJ | value,<br>/m².K | Ахк,<br>kJ/K |                  |
| Window            |                     |                         |                                       |                   |                            | 20              | 0.23 x         | 1.33             | = 26.8                                | 2                         |                 |              | (27)             |
| Door              |                     |                         |                                       |                   |                            | 2               | .14 x          | 1.10             | = 2.35                                | <br>; ]                   |                 |              | (26)             |
| External wall     |                     |                         |                                       |                   |                            | 10              | 3.05 x         | 0.20             | = 20.6                                | 1                         |                 |              | (29a)            |
| Party wall        |                     |                         |                                       |                   |                            | 12              | 2.30 x         | 0.00             | = 0.00                                | )                         |                 |              | (32)             |
| Roof              |                     |                         |                                       |                   |                            | 10              | 6.40 x         | 0.15             | = 15.9                                | 6                         |                 |              | (30)             |
| Total area of ext | ternal elem         | ents ∑A, m <sup>2</sup> | 2                                     |                   |                            | 23              | 1.82           |                  |                                       |                           |                 |              | (31)             |
| Fabric heat loss, | W/K = ∑(A           | × U)                    |                                       |                   |                            |                 |                |                  | (2                                    | 6)(30) + (                | 32) =           | 65.74        | (33)             |
| Heat capacity Cr  | m = ∑(А x к)        | )                       |                                       |                   |                            |                 |                | (28)             | .(30) + (32)                          | + (32a)(3                 | 2e) =           | N/A          | (34)             |
| Thermal mass pa   | arameter (1         | TMP) in kJ/r            | m²K                                   |                   |                            |                 |                |                  |                                       |                           |                 | 250.00       | (35)             |
| Thermal bridges   | s:Σ(LxΨ) c          | alculated u             | sing Appen                            | dix K             |                            |                 |                |                  |                                       |                           |                 | 15.65        | (36)             |
| Total fabric heat | t loss              |                         |                                       |                   |                            |                 |                |                  |                                       | (33) + (                  | 36) =           | 81.40        | <br>(37)         |
|                   | Jan                 | Feb                     | Mar                                   | Apr               | Мау                        | Jun             | Jul            | Aug              | Sep                                   | Oct                       | Nov             | Dec          | _                |
| Ventilation heat  | loss calcul         | ated month              | ily 0.33 x (2                         | 25)m x (5)        |                            |                 |                |                  |                                       |                           |                 |              |                  |
|                   | 24.02               | 23.72                   | 23.43                                 | 21.98             | 21.69                      | 20.23           | 20.23          | 19.94            | 20.81                                 | 21.69                     | 22.27           | 22.85        | (38)             |
| Heat transfer co  | efficient, V        | V/K (37)m +             | + (38)m                               | -                 |                            |                 |                |                  |                                       |                           |                 | ·            | _                |
|                   | 105.41              | 105.12                  | 104.83                                | 103.37            | 103.08                     | 101.63          | 101.63         | 101.34           | 102.21                                | 103.08                    | 103.66          | 104.25       |                  |
|                   |                     |                         |                                       |                   |                            |                 |                |                  | Average =                             | ∑(39)112                  | /12 =           | 103.30       | (39)             |
| Heat loss param   | eter (HLP),         | W/m²K (39               | ∋)m ÷ (4)                             |                   |                            |                 |                |                  |                                       |                           |                 |              |                  |
|                   | 0.99                | 0.99                    | 0.99                                  | 0.97              | 0.97                       | 0.96            | 0.96           | 0.95             | 0.96                                  | 0.97                      | 0.97            | 0.98         |                  |
|                   |                     |                         |                                       |                   |                            |                 |                |                  | Average =                             | ∑(40)112                  | /12 =           | 0.97         | (40)             |
| Number of days    | in month (          | Table 1a)               |                                       |                   |                            |                 |                |                  |                                       |                           |                 |              |                  |
|                   | 31.00               | 28.00                   | 31.00                                 | 30.00             | 31.00                      | 30.00           | 31.00          | 31.00            | 30.00                                 | 31.00                     | 30.00           | 31.00        | (40)             |
| 4 14/-1 h t       |                     |                         |                                       |                   |                            |                 |                |                  | · · · · · · · · · · · · · · · · · · · |                           |                 |              |                  |
| 4. water neath    | ng energy i         | requiremen              | τ                                     |                   |                            |                 |                |                  |                                       |                           |                 |              |                  |
| Assumed occupa    | ancy, N             |                         |                                       |                   | (25                        | 26              |                |                  |                                       |                           |                 | 2.79         | (42)             |
| Annual average    | not water i         | usage in litr           | es per day                            | vo,average        | $e = (25 \times N) +$      | · 30            | 1.1            | <b>A</b> .u.a    | Son                                   | Oct                       |                 | 100.50       | _ (43)           |
| Hot water usage   | jan<br>in litros no | reu<br>or dou for o     | iviai                                 | Api<br>Vd m = fac | tor from Tab               |                 | 2)             | Aug              | Зер                                   | 000                       | NOV             | Dec          |                  |
| not water usage   |                     |                         |                                       |                   |                            |                 | 5)             | 04.47            | 08.40                                 | 102 51                    | 106 52          | 110 55       | ٦                |
|                   | 110.55              | 100.55                  | 102.51                                | 96.49             | 94.47                      | 90.45           | 90.45          | 94.47            | 90.49                                 | 5(44)1                    | 12 -            | 1205.05      |                  |
| Energy content    | of bot wate         | ar used = 1 °           | 18 v Vd m v                           | nm v Tm/          | 3600 kWb/m                 | oonth (see      | a Tables 1b    | 1c 1d)           |                                       | 2(44)1                    | 12 –            | 1205.95      | _ (44)           |
| Energy content    | 163.94              | 1/12 28                 | 1/7 05                                | 178.00            | 122 77                     | 106.80          |                | 112 57           | 11/ 02                                | 122.02                    | 146.20          | 158 76       | ٦                |
|                   | 103.94              | 145.58                  | 147.55                                | 128.99            | 125.77                     | 100.80          | 38.97          | 115.57           | 114.92                                | 5(45)1                    | 12 -            | 1581 10      | _<br>☐ (45)      |
| Distribution loss | 0 15 x (45          | Jm                      |                                       |                   |                            |                 |                |                  |                                       | 2(43)1                    | 12              | 1501.15      | _ (+5)           |
| Distribution 1055 | 24 59               | 21 51                   | 22 19                                 | 19 35             | 18 57                      | 16.02           | 14.85          | 17.04            | 17.24                                 | 20.09                     | 21.93           | 23.81        | (46)             |
| Storage volume    | (litres) incl       | uding any s             | olar or WW                            | /HRS storag       | e within sar               | ne vessel       | 11.05          | 17.01            | 17.21                                 | 20.05                     |                 | 150.00       | ] (10)<br>] (47) |
| Water storage lo  | oss:                | a any s                 |                                       |                   |                            | ne vesser       |                |                  |                                       |                           |                 | 130.00       |                  |
| a) If manufactur  | er's declare        | ed loss facto           | or is known                           | (kWh/day          | )                          |                 |                |                  |                                       |                           |                 | 1.31         | (48)             |
| Temperature       | er s'actor froi     | m Table 2h              |                                       | (ktri) day        | ,                          |                 |                |                  |                                       |                           |                 | 0.54         | ] (10)<br>] (49) |
| Energy lost fi    | rom water           | storage (kW             | /h/day) (4                            | 8) x (49)         |                            |                 |                |                  |                                       |                           |                 | 0.71         | ] (50)           |
| Enter (50) or (54 | l) in (55)          |                         | , , , , , , , , , , , , , , , , , , , | 5/ X (15)         |                            |                 |                |                  |                                       |                           |                 | 0.71         | ] (55)           |
| Water storage lo  | oss calculat        | ed for each             | month (5                              | 5) x (41)m        |                            |                 |                |                  |                                       |                           | L               |              |                  |
|                   | 21.93               | 19.81                   | 21.93                                 | 21.22             | 21.93                      | 21.22           | 21.93          | 21.93            | 21.22                                 | 21.93                     | 21.22           | 21.93        | (56)             |
| If the vessel con | tains dedic         | ated solar s            | torage or o                           | ledicated V       | VWHRS (56)                 | <br>m x [(47) · | - Vs] ÷ (47)   | , else (56)      |                                       |                           |                 |              |                  |
|                   | 21.93               | 19.81                   | 21.93                                 | 21.22             | 21.93                      | 21.22           | 21.93          | 21.93            | 21.22                                 | 21.93                     | 21.22           | 21.93        | (57)             |
|                   |                     |                         |                                       |                   |                            |                 |                |                  |                                       |                           |                 | 1            | ,                |

| Primary circuit lo | oss for each  | month fro  | m Table 3    |                       |                    |               |              |              |                |          |              |         |        |
|--------------------|---------------|--|--------------|-----------------------|--------------------|---------------|--------------|--------------|----------------|----------|--------------|---------|--------|
|                    | 23.26         | 21.01  | 23.26        | 22.51                 | 23.26              | 22.51         | 23.26        | 23.26        | 22.51          | 23.26    | 22.51        | 23.26   | (59)   |
| Combi loss for ea  | ach month f   | from Table   | 3a, 3b or 3  | с                     |                    |               |              |              |                |          |              |         |        |
|                    | 0.00          | 0.00   | 0.00         | 0.00                  | 0.00               | 0.00          | 0.00         | 0.00         | 0.00           | 0.00     | 0.00         | 0.00    | (61)   |
| Total heat requir  | red for wate  | er heating o   | calculated f | or each mo            | onth 0.85 x        | (45)m + (4    | 6)m + (57)r  | n + (59)m +  | - (61)m        |          |              |         |        |
|                    | 209.13        | 184.20   | 193.15       | 172.72                | 168.96             | 150.54        | 144.16       | 158.76       | 158.66         | 179.13   | 189.93       | 203.95  | (62)   |
| Solar DHW input    | calculated    | using Appe   | endix G or A | ppendix H             |                    |               |              |              |                |          |              |         |        |
|                    | 0.00          | 0.00   | 0.00         | 0.00                  | 0.00               | 0.00          | 0.00         | 0.00         | 0.00           | 0.00     | 0.00         | 0.00    | (63)   |
| Output from wat    | ter heater fo | or each mo   | onth (kWh/r  | month) (62            | 2)m + (63)n        | n<br>         |              | 1            |                |          |              |         | 1      |
|                    | 209.13        | 184.20   | 193.15       | 172.72                | 168.96             | 150.54        | 144.16       | 158.76       | 158.66         | 179.13   | 189.93       | 203.95  | 1<br>1 |
|                    |               |  |              | 10.0-                 | ()                 |               | 5(10)        |              |                | ∑(64)1   | .12 = 2      | 113.29  | (64)   |
| Heat gains from    | water heati   | ing (kWh/n   | nonth) 0.25  | 5 × [0.85 × ]         | (45)m + (61        | L)m] + 0.8 ×  | : [(46)m + ( | 57)m + (59)  | mj             |          |              |         |        |
|                    | 90.66         | 80.33  | 85.35        | 77.88                 | 77.31              | 70.50         | 69.06        | 73.91        | 73.20          | 80.69    | 83.60        | 88.94   | (65)   |
| 5. Internal gain   | s             |  |              |                       |                    |               |              |              |                |          |              |         |        |
|                    | Jan           | Feb  | Mar          | Apr                   | May                | Jun           | Jul          | Aug          | Sep            | Oct      | Nov          | Dec     |        |
| Metabolic gains    | (Table 5)     |  |              |                       |                    |               |              |              |                |          |              |         |        |
|                    | 139.57        | 139.57   | 139.57       | 139.57                | 139.57             | 139.57        | 139.57       | 139.57       | 139.57         | 139.57   | 139.57       | 139.57  | (66)   |
| Lighting gains (ca | alculated in  | Appendix   | L, equation  | L9 or L9a),           | also see Ta        | able 5        |              |              |                |          |              |         |        |
|                    | 23.76         | 21.10  | 17.16        | 12.99                 | 9.71               | 8.20          | 8.86         | 11.52        | 15.46          | 19.63    | 22.91        | 24.42   | (67)   |
| Appliance gains    | (calculated   | in Appendi   | x L, equatio | on L13 or L1          | 13a), also s       | ee Table 5    |              |              |                |          |              |         |        |
|                    | 266.28        | 269.04   | 262.08       | 247.26                | 228.54             | 210.96        | 199.21       | 196.44       | 203.41         | 218.23   | 236.94       | 254.53  | (68)   |
| Cooking gains (ca  | alculated in  | Appendix   | L, equation  | L15 or L15            | a), also see       | e Table 5     |              |              |                |          |              |         |        |
|                    | 36.96         | 36.96  | 36.96        | 36.96                 | 36.96              | 36.96         | 36.96        | 36.96        | 36.96          | 36.96    | 36.96        | 36.96   | (69)   |
| Pump and fan ga    | ins (Table 5  | 5a)  |              |                       |                    | _             |              |              |                |          |              |         | 1      |
|                    | 3.00          | 3.00   | 3.00         | 3.00                  | 3.00               | 3.00          | 3.00         | 3.00         | 3.00           | 3.00     | 3.00         | 3.00    | (70)   |
| Losses e.g. evapo  | oration (Tab  | ole 5)   |              |                       |                    |               | 1            |              |                |          |              |         | 1      |
| Mator booting g    | -111.66       | -111.66  | -111.66      | -111.66               | -111.66            | -111.66       | -111.66      | -111.66      | -111.66        | -111.66  | -111.66      | -111.66 | (/1)   |
| water neating go   |               | )<br>110 E4  | 114 72       | 109 16                | 102.01             | 07.02         | 02.02        | 00.25        | 101.67         | 109.45   | 116 11       | 110 55  | (72)   |
| Total internal gai | 121.80        | (67)m + (67) | 114.72       | 108.10<br>m + (70)m - | 103.91 + (71)m + ( | 97.92<br>72)m | 92.82        | 99.35        | 101.67         | 108.45   | 110.11       | 119.55  | (72)   |
| i otai internai ga |               | 477 55   | 461.83       | 136.28                | 410.03             | 28/ 0/        | 368 76       | 275 18       | 388.40         | 111 18   | 113.83       | 466.36  | (72)   |
|                    | 479.77        | 477.55   | 401.83       | 430.28                | 410.03             | 364.94        | 308.70       | 575.18       | 388.40         | 414.10   | 445.85       | 400.30  | (75)   |
| 6. Solar gains     |               |  |              |                       |                    |               |              |              |                |          |              |         |        |
|                    |               |  | Access f     | actor                 | Area               | Sol           | ar flux      |              | g<br>Sfie dete | FF       | 1-1-         | Gains   |        |
|                    |               |  | Table        | 60                    | m-                 | v             | v/m-         | spec<br>or T | able 6b        | or Table | ata<br>9 6 c | vv      |        |
| NorthWest          |               |  | 0.7          | 7 x [                 | 3.38               | x 1           | 1.28 x       | 0.9 x (      | ).72 x         | 0.80     | =            | 15.22   | (81)   |
| SouthEast          |               |  | 0.7          | 7 X                   | 16.85              | <br>x3        | 6.79 x       | 0.9 x 0      | ).72 x         | 0.80     |              | 247.47  | (77)   |
| Solar gains in wa  | tts ∑(74)m    | (82)m  |              |                       |                    |               |              |              |                |          |              |         |        |
|                    | 262.70        | 452.53   | 632.60       | 806.33                | 923.71             | 926.07        | 889.06       | 800.12       | 692.55         | 503.76   | 315.57       | 224.22  | (83)   |
| Total gains - inte | rnal and so   | lar (73)m +  | (83)m        |                       |                    |               |              |              |                |          |              |         |        |
|                    | 742.46        | 930.08   | 1094.42      | 1242.61               | 1333.74            | 1311.01       | 1257.83      | 1175.30      | 1080.95        | 917.94   | 759.40       | 690.58  | (84)   |
| 7. Mean intern     | al temperat   | ture (heati  | ng season)   |                       |                    |               |              |              |                |          |              |         |        |
| Temperature du     | ring heating  | g periods ir   | the living a | area from T           | able 9, Th         | L(°C)         |              |              |                |          |              | 21.00   | (85)   |
|                    | Jan           | Feb  | Mar          | Apr                   | May                | Jun           | Jul          | Aug          | Sep            | Oct      | Nov          | Dec     |        |
| Utilisation factor | for gains fo  | or living are  | ea n1,m (se  | e Table 9a)           | 1                  |               |              |              |                |          |              |         |        |
|                    | 1.00          | 0.98   | 0.95         | 0.85                  | 0.69               | 0.49          | 0.35         | 0.40         | 0.63           | 0.91     | 0.99         | 1.00    | (86)   |

| Mean internal t   | emp of livin   | g area T1 (s | steps 3 to 7  | in Table 90  | c)           |              |             |        |        |               |         |         |                |
|-------------------|----------------|--------------|---------------|--------------|--------------|--------------|-------------|--------|--------|---------------|---------|---------|----------------|
|                   | 20.26          | 20.42        | 20.63         | 20.82        | 20.92        | 20.95        | 20.95       | 20.95  | 20.94  | 20.79         | 20.48   | 20.23   | (87)           |
| Temperature du    | uring heatin   | g periods in | the rest of   | f dwelling f | rom Table    | 9, Th2(°C)   |             |        |        |               |         |         |                |
|                   | 20.09          | 20.09        | 20.10         | 20.11        | 20.11        | 20.12        | 20.12       | 20.12  | 20.12  | 20.11         | 20.10   | 20.10   | (88)           |
| Utilisation facto | or for gains f | or rest of d | welling n2,   | m            | •            |              |             |        |        |               |         |         | -              |
|                   | 0.99           | 0.98         | 0.94          | 0.82         | 0.63         | 0.43         | 0.28        | 0.32   | 0.56   | 0.88          | 0.98    | 1.00    | ] (89)         |
| Mean internal t   | emperature     | in the rest  | of dwelling   | T2 (follow   | steps 3 to   | 7 in Table 9 | <u>а</u> с) |        |        |               |         |         | ] ( )          |
|                   | 10 10          | 10.34        | 19.63         | 10 00        | 20.01        | 20.05        | 20.05       | 20.05  | 20.04  | 10.87         | 10/13   | 19.06   |                |
| Living area fract |                | 15.54        | 15.05         | 15.50        | 20.01        | 20.05        | 20.05       | 20.05  | 20:04  | 15.07         | (4) =   | 0.40    | ] (01)         |
| Living area nact  | omnorature     | for the wh   | مام طبيرمالنم | a fl A v T1  | (1 fl A) v   | тэ           |             |        | L      | vilig alea ÷  | (4) -   | 0.40    | ] (91)         |
| Mean internal t   |                |              |               |              |              | 12           | 20.44       | 20.44  | 20.40  | 20.22         | 40.05   | 10.50   |                |
|                   | 19.56          | 19.77        | 20.02         | 20.27        | 20.37        | 20.41        | 20.41       | 20.41  | 20.40  | 20.23         | 19.85   | 19.52   | ] (92)         |
| Apply adjustme    | nt to the m    | ean internal | l temperati   | ure from Ta  | ble 4e whe   | ere appropr  | iate        |        |        | 1             | 1       |         | -              |
|                   | 19.41          | 19.62        | 19.87         | 20.12        | 20.22        | 20.26        | 20.26       | 20.26  | 20.25  | 20.08         | 19.70   | 19.37   | (93)           |
| 8 Snace heati     | ng requiren    | aent         |               |              |              |              |             |        |        |               |         |         |                |
| o. opuce neutri   | lan            | Ech          | Mar           | Apr          | May          | lum          | 1.1         | Διια   | Fon    | Oct           | Nov     | Dec     |                |
|                   | Jan            | rep          | IVIdI         | Арі          | Ividy        | Jun          | Jui         | Aug    | Seh    | 000           | NUV     | Dec     |                |
| Utilisation facto | or for gains,  | ηm<br>       |               |              |              | 1            |             |        | L -    |               |         |         | ٦              |
|                   | 0.99           | 0.98         | 0.93          | 0.82         | 0.64         | 0.44         | 0.30        | 0.33   | 0.57   | 0.88          | 0.98    | 1.00    | ] (94)         |
| Useful gains, ηn  | nGm, W (94     | 1)m x (84)m  |               |              | 1            |              |             |        | 1      |               |         |         | _              |
|                   | 737.21         | 908.84       | 1022.14       | 1020.37      | 850.19       | 572.39       | 371.80      | 390.93 | 616.70 | 805.90        | 744.98  | 687.19  | (95)           |
| Monthly averag    | e external t   | emperature   | e from Tabl   | e U1         |              |              |             |        |        |               |         |         | _              |
|                   | 4.30           | 4.90         | 6.50          | 8.90         | 11.70        | 14.60        | 16.60       | 16.40  | 14.10  | 10.60         | 7.10    | 4.20    | (96)           |
| Heat loss rate fo | or mean inte   | ernal tempe  | erature, Lm   | , W [(39)m   | ı x [(93)m - | (96)m]       |             |        |        |               |         |         |                |
|                   | 1592.44        | 1547.30      | 1401.99       | 1159.52      | 878.78       | 575.01       | 372.02      | 391.35 | 628.16 | 977.64        | 1306.13 | 1581.83 | (97)           |
| Space heating re  | equirement     | , kWh/mon    | th 0.024 x    | [(97)m - (9  | 5)m] x (41)  | )m           |             |        |        |               |         |         |                |
|                   | 636.30         | 429.05       | 282.61        | 100.19       | 21.27        | 0.00         | 0.00        | 0.00   | 0.00   | 127.78        | 404.03  | 665.62  | ]              |
|                   |                |              |               |              |              |              |             |        | ∑(98   | 3)15, 10      | .12 = 2 | 2666.83 | (98)           |
| Space heating ro  | equirement     | kWh/m²/ye    | ear           |              |              |              |             |        |        | (98)          | ÷ (4)   | 25.06   | _<br>] (99)    |
|                   |                |              |               |              |              |              |             |        |        |               |         |         | J · ·          |
| 9a. Energy req    | uirements ·    | individual   | heating sy    | stems inclu  | iding micro  | D-CHP        |             |        |        |               |         |         |                |
| Space heating     |                |              |               |              |              |              |             |        |        |               |         |         |                |
| Fraction of space | e heat from    | secondary    | /suppleme     | ntary syste  | m (table 1   | 1)           |             |        |        |               |         | 0.00    | (201)          |
| Fraction of space | e heat from    | n main syste | em(s)         |              |              |              |             |        |        | 1 - (2        | 01) =   | 1.00    | (202)          |
| Fraction of space | e heat from    | n main syste | em 2          |              |              |              |             |        |        |               |         | 0.00    | (202)          |
| Fraction of total | l space heat   | from main    | system 1      |              |              |              |             |        | (20    | 02) x [1- (20 | 3)] =   | 1.00    | (204)          |
| Fraction of total | I space heat   | from main    | system 2      |              |              |              |             |        |        | (202) x (2    | 03) =   | 0.00    | (205)          |
| Efficiency of ma  | in system 1    | (%)          | -             |              |              |              |             |        |        |               |         | 92.70   | (206)          |
| ,                 | Jan            | Feb          | Mar           | Apr          | Mav          | Jun          | Jul         | Aug    | Sep    | Oct           | Nov     | Dec     | ] (/           |
| Space heating fu  | uel (main sy   | (stem 1) kV  | h/month       |              |              |              |             | . 0    |        |               | -       |         |                |
| 00000             | 686.40         | 162.83       | 304.87        | 108.08       | 22.05        | 0.00         | 0.00        | 0.00   | 0.00   | 127.8/        | 135.85  | 718.03  | T              |
|                   | 080.40         | 402.85       | 504.87        | 108.08       | 22.95        | 0.00         | 0.00        | 0.00   | 5/21/  | 137.64        | 12 -    |         | ]<br>] (211)   |
| Motor boot        |                |              |               |              |              |              |             |        | 2(21)  | 1,15, 10      | .12 =   | -070.84 | ] (211)        |
| water neating     | +ox b +        |              |               |              |              |              |             |        |        |               |         |         |                |
| Enciency of wa    | ter neater     |              |               |              |              |              |             |        |        |               |         |         | ٦,             |
|                   | 87.39          | 86.80        | 85.63         | 83.22        | 80.67        | 79.60        | 79.60       | 79.60  | 79.60  | 83.73         | 86.58   | 87.54   | <b>_ (217)</b> |
| Water heating f   | uel, kWh/m     | onth         | r             | 1            | 1            | 1            | 1           |        | 1      | 1             | 1       |         | -              |
|                   | 239.29         | 212.22       | 225.57        | 207.55       | 209.45       | 189.12       | 181.11      | 199.45 | 199.32 | 213.93        | 219.38  | 232.98  |                |
|                   |                |              |               |              |              |              |             |        |        | ∑(219a)1      | .12 = 2 | 2529.36 | (219)          |

#### Annual totals

| Space heating fuel - main system 1  |                    |       |   | [              | 2876 84                               | 1       |
|---|--------------------|-------|---|----------------|---------------------------------------|---------|
| Water heating fuel  |                    |       |   | l<br>[         | 2579.36                               | ]       |
| Electricity for pumps, fans and electric keep-hot (Table 4f)                |                    |       |   | l              | 2323.30                               | ]       |
| mechanical ventilation fans - halanced, extract or nositive innu            | ut from outside    | Г     | 181 41                                    |                |                                       | (230a)  |
| central heating nump or water nump within warm air heating                  | unit               |       | 30.00                                     |                |                                       | (230c)  |
| boiler flue fan   |                    |       | 45.00                                     |                |                                       | (230e)  |
| Total electricity for the above, kWh/year                                   |                    | L     |   | [              | 256.41                                | (231)   |
| Electricity for lighting (Appendix I )                                      |                    |       |   | [              | 419.57                                | (232)   |
| Total delivered energy for all uses   |                    | (211) | (221) + (231) + (2                        | 32)(237b) =    | 6082.19                               | (238)   |
|   |                    | (===) | (221) · (231) · (2                        | 52,(25,5,6)    | 0002.13                               | ] (200) |
| 10a. Fuel costs - individual heating systems including micro-CH             | Р                  |       |   |                |                                       |         |
|   | Fuel               |       | Fuel price                                |                | Fuel                                  |         |
|   | kWh/year           | _     |   | r              | cost £/year                           | 1       |
| Space heating - main system 1   | 2876.84            | ×     | 3.48                                      | x 0.01 =       | 100.11                                | ] (240) |
| Water heating   | 2529.36            | ×     | 3.48                                      | x 0.01 =       | 88.02                                 | (247)   |
| Pumps and fans  | 256.41             | x     | 13.19                                     | x 0.01 =       | 33.82                                 | (249)   |
| Electricity for lighting  | 419.57             | x     | 13.19                                     | x 0.01 =       | 55.34                                 | (250)   |
| Additional standing charges   |                    |       |   |                | 120.00                                | (251)   |
| Total energy cost   |                    |       | (240)(242) + (                            | 245)(254) =    | 397.30                                | (255)   |
| 11a. SAP rating - individual heating systems including micro-CH             | IP                 |       |   |                |                                       |         |
| Energy cost deflator (Table 12)   |                    |       |   | [              | 0.42                                  | (256)   |
| Energy cost factor (ECF)  |                    |       |   | [              | 1.10                                  | (257)   |
| SAP value   |                    |       |   | [              | 84.63                                 | ]       |
| SAP rating (section 13)   |                    |       |   | [              | 85                                    | (258)   |
| SAP band  |                    |       |   | [              | В                                     | ]       |
|   |                    |       |   | L              |                                       | J       |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro | o-CHP              |       |   |                |                                       |         |
|   | Energy<br>kWh/year | E     | mission factor<br>kg CO <sub>2</sub> /kWh |                | Emissions<br>kg CO <sub>2</sub> /year |         |
| Space heating - main system 1   | 2876.84            | хГ    | 0.22                                      | = [            | 621.40                                | (261)   |
| Water heating   | 2529.36            | хГ    | 0.22                                      | = [            | 546.34                                | (264)   |
| Space and water heating   |                    |       | (261) + (262) + (2                        | 263) + (264) = | 1167.74                               | (265)   |
| Pumps and fans  | 256.41             | хГ    | 0.52                                      | = [            | 133.08                                | (267)   |
| Electricity for lighting  | 419.57             | ×     | 0.52                                      | = [            | 217.76                                | (268)   |
| Total CO <sub>2</sub> , kg/year   |                    | L     |   | 265)(271) =    | 1518.58                               | (272)   |
| Dwelling CO <sub>2</sub> emission rate                                      |                    |       | ,   | (272) ÷ (4) =  | 14.27                                 | (273)   |
| El value  |                    |       |   | . , , , [      | 86.56                                 | ]       |
| El rating (section 14)  |                    |       |   | [              | 87                                    | (274)   |
| El band   |                    |       |   | [              | В                                     | ] (     |
|   |                    |       |   |                |                                       | -       |
| 13a. Primary energy - individual heating systems including mici             | ro-CHP             |       |   |                |                                       |         |

|                               | Energy<br>kWh/year |   | Primary factor  |                 | Primary Energy<br>kWh/year | 1     |
|-------------------------------|--------------------|---|-----------------|-----------------|----------------------------|-------|
| Space heating - main system 1 | 2876.84            | x | 1.22            | =               | 3509.75                    | (261) |
| Water heating                 | 2529.36            | x | 1.22            | =               | 3085.82                    | (264) |
| Space and water heating       |                    |   | (261) + (262) + | (263) + (264) = | 6595.57                    | (265) |
| Pumps and fans                | 256.41             | х | 3.07            | =               | 787.17                     | (267) |
| Electricity for lighting      | 419.57             | х | 3.07            | =               | 1288.09                    | (268) |
| Primary energy kWh/year       |                    |   |                 |                 | 8670.84                    | (272) |



| Assessor name          |            | Mr John       | Simpson        |               |              |                         |               |           | Assessor nur                 | nber          | 3722   |                       |        |
|------------------------|------------|---------------|----------------|---------------|--------------|-------------------------|---------------|-----------|------------------------------|---------------|--------|-----------------------|--------|
| Client                 |            |               |                |               |              |                         |               |           | Last modified                | t             | 19/11, | /2014                 |        |
| Address                |            | Unit 4.01     | Marine Ice     | es Haversto   | ock Hill, Lo | ndon, NW3               | 2BL           |           |                              |               |        |                       |        |
|                        |            |               |                |               |              |                         |               |           |                              |               |        |                       |        |
| 1. Overall dwelling    | dimens     | ions          |                |               |              |                         |               |           |                              |               |        |                       |        |
|                        |            |               |                |               | ļ            | Area (m²)               |               |           | Average storey<br>height (m) | 1             | Vo     | lume (m³)             |        |
| Lowest occupied        |            |               |                |               |              | 98.00                   | (1a) x        |           | 2.60                         | (2a) =        |        | 254.80                | (3a)   |
| Total floor area       |            | (1a)          | + (1b) + (1e   | c) + (1d)(    | 1n) =        | 98.00                   | (4)           |           |                              |               |        |                       |        |
| Dwelling volume        |            |               |                |               |              |                         |               |           | (3a) + (3b) + (3             | 3c) + (3d)(3  | n) =   | 254.80                | (5)    |
| 2 Ventilation rate     |            |               |                |               |              |                         |               |           |                              | _             |        |                       |        |
| 2. Ventilation rate    |            |               |                |               |              |                         |               |           |                              |               | mª     | <sup>i</sup> ner hour |        |
|                        |            |               |                |               |              |                         |               | Г         |                              | 7             |        |                       |        |
| Number of chimney      | S          |               |                |               |              |                         |               |           | 0                            | x 40 =        |        |                       | _ (6a) |
| Number of open flue    | es         |               |                |               |              |                         |               | L<br>T    | 0                            | X 20 =        |        |                       | (6b)   |
| Number of Intermitt    | tent fans  | 5             |                |               |              |                         |               | L         | 0                            | _ X10=        |        |                       | ] (7a) |
| Number of passive v    | ents       |               |                |               |              |                         |               | L         | 0                            | X10=          |        |                       | _ (7)  |
| Number of flueless §   | gas tires  |               |                |               |              |                         |               |           | 0                            | x 40 =        |        |                       | _ (/c) |
|                        |            |               |                |               |              |                         |               |           |                              |               |        | hour                  | ſ      |
| Infiltration due to ch | nimneys    | , flues, fans | s, PSVs        |               | (6a          | ) + (6b) + (7           | 'a) + (7b) +  | (7c) = [  | 0                            | ÷ (5) =       |        | 0.00                  | (8)    |
| If a pressurisation te | est has b  | een carried   | d out or is ii | ntended, p    | roceed to    | (17), otherv            | vise continu  | le from   | (9) to (16)                  |               |        |                       |        |
| Air permeability valu  | ue, q50,   | expressed     | in cubic me    | etres per h   | our per sq   | uare metre              | of envelop    | e area    |                              |               |        | 3.00                  | (17)   |
| If based on air perm   | eability   | value, ther   | n (18) = [(17  | 7) ÷ 20] + (8 | 3), otherw   | ise (18) = (1           | .6)           |           |                              |               |        | 0.15                  | (18)   |
| Number of sides on     | which th   | ne dwelling   | g is sheltere  | ed            |              |                         |               |           |                              |               |        | 2                     | (19)   |
| Shelter factor         |            |               |                |               |              |                         |               |           | 1                            | - [0.075 x (1 | 9)] =  | 0.85                  | (20)   |
| Infiltration rate inco | rporatin   | g shelter f   | actor          |               |              |                         |               |           |                              | (18) x (2     | .0) =  | 0.13                  | (21)   |
| Infiltration rate mod  | lified for | monthly       | wind speed     | :             |              |                         |               |           |                              |               |        |                       |        |
|                        | Jan        | Feb           | Mar            | Apr           | May          | Jun                     | Jul           | Au        | g Sep                        | Oct           | Nov    | Dec                   |        |
| Monthly average wi     | nd spee    | d from Tab    | ole U2         |               |              |                         |               |           |                              |               |        |                       |        |
|                        | 5.10       | 5.00          | 4.90           | 4.40          | 4.30         | 3.80                    | 3.80          | 3.7       | 0 4.00                       | 4.30          | 4.50   | 4.70                  | (22)   |
| Wind factor (22)m ÷    | - 4        |               |                |               |              |                         |               |           |                              |               |        |                       |        |
|                        | 1.28       | 1.25          | 1.23           | 1.10          | 1.08         | 0.95                    | 0.95          | 0.9       | 3 1.00                       | 1.08          | 1.13   | 1.18                  | (22a)  |
| Adjusted infiltration  | rate (al   | lowing for    | shelter and    | I wind facto  | or) (21) x ( | 22a)m                   |               |           |                              |               |        |                       |        |
|                        | 0.16       | 0.16          | 0.16           | 0.14          | 0.14         | 0.12                    | 0.12          | 0.1       | 2 0.13                       | 0.14          | 0.14   | 0.15                  | (22b)  |
| Calculate effective a  | ir chang   | e rate for t  | the applical   | ble case:     |              |                         |               |           |                              |               |        |                       |        |
| If mechanical ver      | ntilation  | : air chang   | e rate throu   | ugh system    |              |                         |               |           |                              |               |        | 0.50                  | (23a)  |
| If balanced with       | heat rec   | overy: effi   | ciency in %    | allowing fo   | or in-use fa | actor from <sup>-</sup> | Table 4h      |           |                              |               |        | 79.90                 | (23c)  |
| a) If balanced me      | echanica   | l ventilatio  | on with hea    | t recovery    | (MVHR) (2    | 2b)m + (23              | b) x [1 - (23 | sc) ÷ 100 | )]                           |               |        |                       |        |
|                        | 0.26       | 0.26          | 0.26           | 0.24          | 0.24         | 0.22                    | 0.22          | 0.2       | 2 0.23                       | 0.24          | 0.24   | 0.25                  | (24a)  |
| Effective air change   | rate - er  | nter (24a) o  | or (24b) or    | (24c) or (24  | ld) in (25)  |                         |               |           |                              |               |        |                       |        |
|                        | 0.26       | 0.26          | 0.26           | 0.24          | 0.24         | 0.22                    | 0.22          | 0.2       | 2 0.23                       | 0.24          | 0.24   | 0.25                  | (25)   |



| Element   |   |  | а   | Gross<br>rea, m²  | Openings<br>m <sup>2</sup>   | Net<br>A,   | area<br>m²  | U-value<br>W/m²K  | AXUW  | //К к-\<br>kJ  | /alue,<br>/m².K                                    | Ахк,<br>kJ/K   |  |
|---|---|--|---|---|--|---|---|---|---|--|--|--|--|
| Window  |   |  |   |   |  | 50  | .50 x   | 1.33  | = 66.95   | 5  |  |  | (27)   |
| Door  |   |  |   |   |  | 2.  | 14 x  | 1.10  | = 2.35  |  |  |  | (26)   |
| External wall   |   |  |   |   |  | 58  | .64 x   | 0.20  | = 11.73   | 3  |  |  | (29a)  |
| Roof  |   |  |   |   |  | 98  | .00 x   | 0.15  | = 14.70   | )  |  |  | (30)   |
| Total area of ext   | ernal eleme   | ents ∑A, m <sup>2</sup>  | 2   |   |  | 209   | 0.28  |   |   |  |  |  | (31)   |
| Fabric heat loss,   | W/K = ∑(A   | × U)   |   |   |  |   |   |   | (2  | 6)(30) + (   | 32) =  | 95.73  | (33)   |
| Heat capacity Cr  | m = ∑(А x к)  |  |   |   |  |   |   | (28)  | (30) + (32)                                       | + (32a)(3  | 2e) =  | N/A  | (34)   |
| Thermal mass p  | arameter (T   | MP) in kJ/r  | m²K   |   |  |   |   |   |   |  |  | 250.00   | (35)   |
| Thermal bridges   | : Σ(L x Ψ) ca   | alculated us   | sing Appen  | dix K   |  |   |   |   |   |  |  | 19.94  | (36)   |
| Total fabric heat   | loss  |  |   |   |  |   |   |   |   | (33) + (   | 36) =  | 115.68   | (37)   |
|   | Jan   | Feb  | Mar   | Apr   | May  | Jun   | Jul   | Aug   | Sep   | Oct  | Nov  | Dec  |  |
| Ventilation heat  | loss calcula  | ited month   | nly 0.33 x (2   | 25)m x (5)  |  |   |   |   |   |  |  |  |  |
|   | 22.12   | 21.85  | 21.58   | 20.24   | 19.98  | 18.64   | 18.64   | 18.37   | 19.17   | 19.98  | 20.51  | 21.05  | (38)   |
| Heat transfer co  | efficient, W  | '<br>/K (37)m⊣   | + (38)m   |   | I I  |   |   | 1   | 1   |  |  |  | _ • •  |
|   | 137.80  | 137.53   | 137.26  | 135.92  | 135.65   | 134.31  | 134.31  | 134.04  | 134.85  | 135.65   | 136.19   | 136.72   | 7  |
|   |   | 1  |   |   | II   |   |   |   | Average =   | Σ(39)112,  | /12 =  | 135.85   | _<br>] (39)  |
| Heat loss param   | eter (HLP),   | W/m²K (39  | 9)m ÷ (4)   |   |  |   |   |   | 0   | , ,  |  |  |  |
| ·   | 1.41  | 1.40   | 1.40  | 1.39  | 1.38   | 1.37  | 1.37  | 1.37  | 1.38  | 1.38   | 1.39   | 1.40   | 7  |
|   |   | -  |   |   |  |   |   |   | Average =   | $\Sigma(40)112$  | /12 =  | 1.39   | _<br>] (40)  |
| Number of days  | in month (1   | Table 1a)  |   |   |  |   |   |   |   |  |  |  |  |
| ,   | 31.00   | 28.00  | 31.00   | 30.00   | 31.00  | 30.00   | 31.00   | 31.00   | 30.00   | 31.00  | 30.00  | 31.00  | (40)   |
|   |   |  |   |   |  |   |   |   |   |  |  |  |  |
| 4. Water heati  | ng energy r   | equiremen  | it  |   |  |   |   |   |   |  |  |  |  |
| Assumed occupa  | ancy, N   |  |   |   |  |   |   |   |   |  |  |  |  |
| Annual average  |   |  |   |   |  |   |   |   |   |  |  | 2.72   | (42)   |
| -   | not water u   | sage in litr   | es per day  | Vd,average  | = (25 x N) +   | 36  |   |   |   |  |  | 2.72<br>98.81  | (42)<br>(43)   |
| -   | hot water u<br>Jan  | sage in litr<br><b>Feb</b>   | es per day<br><b>Mar</b>  | Vd,average<br><b>Apr</b>  | = (25 x N) +<br>May  | 36<br>Jun   | Jul   | Aug   | Sep   | Oct  | Nov  | 2.72<br>98.81<br>Dec   | _ (42)<br>] (43)   |
| Hot water usage   | hot water u<br>Jan<br>e in litres pe  | sage in litr<br><b>Feb</b><br>r day for ea   | es per day<br><b>Mar</b><br>ach month   | Vd,average<br><b>Apr</b><br>Vd,m = fact   | = (25 x N) +<br><b>May</b><br>for from Tab   | 36<br><b>Jun</b><br>le 1c x (43   | lut<br>(  | Aug   | Sep   | Oct  | Nov  | 2.72<br>98.81<br>Dec   | _ (42)<br>] (43)   |
| Hot water usage   | Jan<br>in litres pe<br>108.69   | sage in litr<br>Feb<br>r day for ea<br>104.73  | es per day<br>Mar<br>ach month<br>100.78  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83  | = (25 x N) +<br><b>May</b><br>for from Tab   | 36<br>Jun<br>le 1c x (43<br>88.92   | Jul<br>)<br>88.92   | Aug<br>92.88  | <b>Sep</b><br>96.83                               | <b>Oct</b> 100.78  | Nov  | 2.72<br>98.81<br>Dec<br>108.69   | _ (42)<br>] (43)<br>]  |
| Hot water usage   | hot water u<br>Jan<br>e in litres pe<br>108.69  | sage in litr<br><b>Feb</b><br>r day for ea<br>104.73   | es per day '<br>Mar<br>ach month<br>100.78  | Vd,average<br>Apr<br>Vd,m = fact<br>96.83   | = (25 x N) +<br><b>May</b><br>for from Tab<br>92.88  | 36<br>Jun<br>le 1c x (43<br>88.92   | Jul<br>)<br>88.92   | Aug<br>92.88  | <b>Sep</b><br>96.83                               | <b>Oct</b><br>100.78<br>Σ(44)1                                       | Nov  | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66  | _ (42)<br>] (43)<br>] (44)   |
| Hot water usage<br>Energy content   | Jan<br>Jan<br>in litres pe<br>108.69  | sage in litr<br>Feb<br>r day for ea<br>104.73<br>r used = 4.1  | es per day<br>Mar<br>ach month<br>100.78  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83  | = (25 x N) +<br><b>May</b><br>for from Tab<br>92.88<br>8600 kWh/m  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see  | Jul<br>)<br>88.92<br>Tables 1b,   | Aug<br>92.88<br>1c 1d)  | <b>Sep</b><br>96.83                               | <b>Oct</b> 100.78 Σ(44)1   | Nov  | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66  | ] (42)<br>] (43)<br>] (44)   |
| Hot water usage<br>Energy content   | hot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate   | sage in litr<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4<br>140.97   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>nm x Tm/3<br>126.82   | = (25 x N) +<br><b>May</b><br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30  | Aug<br>92.88<br>1c 1d)<br>111.66  | Sep<br>96.83<br>112.99                            | <b>Oct</b> 100.78 Σ(44)1 131.68                                      | Nov<br>104.73<br>.12 =<br>143.74                   | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>156.09  | ] (42)<br>] (43)<br>] (44)   |
| Hot water usage<br>Energy content   | hot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18   | sage in litr<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4.:<br>140.97   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30  | Aug<br>92.88<br>1c 1d)<br>111.66  | Sep<br>96.83<br>112.99                            | <b>Oct</b> 100.78 Σ(44)1 131.68 Σ(45)1                               | Nov<br>104.73<br>.12 =<br>143.74<br>.12 =          | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59   | ) (42)<br>) (43)<br>) (44)<br>) (45)   |
| Hot water usage<br>Energy content<br>Distribution loss  | hot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18   | sage in litr<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4.:<br>140.97   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>: nm x Tm/3<br>126.82   | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30  | Aug<br>92.88<br>1c 1d)<br>111.66  | Sep<br>96.83<br>112.99                            | <b>Oct</b> 100.78 Σ(44)1 131.68 Σ(45)1                               | Nov<br>104.73<br>.12 =<br>143.74<br>.12 =          | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59   | ] (42)<br>] (43)<br>] (44)<br>] (45)   |
| Hot water usage<br>Energy content<br>Distribution loss  | Jan         in litres pe         108.69         of hot wate         161.18         0.15 x (45)         24.18  | sage in litr<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4.2<br>140.97<br>m<br>21.15   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>nm x Tm/3<br>126.82<br>19.02  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75   | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75          | Nov<br>104.73<br>.12 =<br>143.74<br>.12 =<br>21.56 | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41  | ) (42)<br>) (43)<br>) (43)<br>) (44)<br>) (45)<br>) (46)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume  | hot water u<br>Jan<br>e in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu   | sage in litr<br>Feb<br>r day for ea<br>104.73<br>r used = 4.:<br>140.97<br>m<br>21.15<br>uding any s   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>: nm x Tm/3<br>126.82<br>19.02<br>/HRS storag   | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25<br>te within sam   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75          | Nov<br>104.73<br>.12 =<br>143.74<br>.12 =<br>21.56 | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00  | ) (42)<br>) (43)<br>) (43)<br>) (44)<br>) (44)<br>) (45)<br>) (46)<br>) (47)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo  | Jan         in litres pe         108.69         of hot wate         161.18         0.15 x (45)         24.18         (litres) incluoss:   | sage in litr           Feb           r day for ea           104.73           r used = 4.3           140.97           m           21.15           uding any s   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>nm x Tm/3<br>126.82<br>19.02<br>/HRS storag   | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25<br>re within sam   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75          | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00  | ) (42)<br>) (43)<br>) (43)<br>) (44)<br>) (45)<br>) (45)<br>) (46)<br>) (47)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur  | hot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) incluoss:<br>er's declare   | sage in litr<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4.:<br>140.97<br>m<br>21.15<br>uding any so<br>d loss factor  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW   | Vd,average<br>Apr<br>Vd,m = fact<br>96.83<br>mm x Tm/3<br>126.82<br>19.02<br>/HRS storage<br>(kWh/day)  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25<br>re within sam   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95                   | <b>Oct</b> 100.78 Σ(44)1 131.68 Σ(45)1 19.75                         | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.31  | ) (42)<br>) (43)<br>) (43)<br>) (44)<br>) (44)<br>) (45)<br>) (45)<br>) (46)<br>) (47)<br>) (48)                                       |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature   | hot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>factor from  | sage in litr           Feb           r day for ea           104.73           r used = 4.3           140.97           m           21.15           uding any s           d loss factor           n Table 2b  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>mm x Tm/3<br>126.82<br>19.02<br>/HRS storag<br>(kWh/day)  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>re within sam   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75          | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.31<br>0.54                                  | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(49)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi   | hot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>e factor from<br>rom water s   | sage in litr           Feb           r day for ea           104.73           r used = 4.:           140.97           um           21.15           uding any so           d loss factor           n Table 2b           torage (kW)  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>Vh/day) (48                                 | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>(hRS storage<br>(kWh/day)<br>8) x (49)  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25<br>re within sam   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75          | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.31<br>0.54<br>0.71                          | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(49)<br>(50)                                 |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54  | Inot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) incluoss:<br>er's declare<br>efactor from<br>rom water s<br>0 in (55)  | sage in litr           Feb           r day for ea           104.73           r used = 4           140.97           m           21.15           uding any s           d loss factor           n Table 2b           torage (kW)  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>(19.02<br>VHRS storage<br>(kWh/day)<br>8) x (49)                                  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>re within sam   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95                   | <b>Oct</b> 100.78 Σ(44)1 131.68 Σ(45)1 19.75                         | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.31<br>0.54<br>0.71<br>0.71                  | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)                                 |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54  | hot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>factor from<br>rom water s<br>0, in (55)<br>oss calculate  | sage in litr<br>Feb<br>r day for ea<br>104.73<br>r used = 4.:<br>140.97<br>m<br>21.15<br>uding any s<br>d loss factor<br>n Table 2b<br>torage (kW<br>ed for each   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>vh/day) (48<br>month (55                    | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>(hRS storage<br>(kWh/day)<br>3) x (49)<br>5) x (41)m                              | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>re within sam   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75          | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.31<br>0.54<br>0.71<br>0.71                  | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)                                   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54<br>Water storage lo                      | Inot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) incluoss:<br>er's declare<br>er s declare<br>efactor from<br>rom water s<br>0 in (55)<br>oss calculate<br>21.93                                | sage in litr           Feb           r day for ea           104.73           r used = 4           140.97           m           21.15           uding any s           d loss factor           n Table 2b           torage (kW)           ed for each           19.81  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>vh/day) (48<br>month (55)<br>21.93                         | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>126.82<br>126.82<br>(hRS storage<br>(kWh/day)<br>3) x (49)<br>5) x (41)m<br>21.22                         | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>re within sam<br>21.93  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95<br>21.22          | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75<br>21.93 | Nov 104.73 .12 = 143.74 .12 = 21.56 21.22          | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.31<br>0.54<br>0.71<br>0.71<br>0.71<br>21.93 | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(44)<br>(45)<br>(47)<br>(48)<br>(49)<br>(49)<br>(50)<br>(55)<br>(55)                         |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54<br>Water storage lo<br>If the vessel con | hot water u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>er's declare<br>er's declare<br>factor from<br>water s<br>b) in (55)<br>oss calculate<br>21.93<br>tains dedica | sage in litr<br>Feb<br>r day for ea<br>104.73<br>r used = 4.1<br>140.97<br>m<br>21.15<br>uding any s<br>d loss factor<br>n Table 2b<br>torage (kW<br>ed for each<br>19.81<br>ated solar s  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>18 x Vd,m x<br>21.82<br>olar or WW<br>or is known<br>vh/day) (48<br>month (59<br>21.93<br>storage or c     | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>126.82<br>19.02<br>/HRS storag<br>(kWh/day)<br>3) x (49)<br>5) x (41)m<br>21.22<br>ledicated W            | <ul> <li>= (25 x N) + May</li> <li>for from Tab</li> <li>92.88</li> <li>3600 kWh/m</li> <li>121.69</li> <li>18.25</li> <li>a within sam</li> <li>21.93</li> <li>/WHRS (56)r</li> </ul> | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel<br>21.22<br>n x [(47) -          | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60<br>14.60<br>21.93<br>Vs] ÷ (47),          | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75<br>16.75<br>21.93<br>else (56)          | Sep<br>96.83<br>112.99<br>16.95<br>21.22          | Oct<br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75<br>21.93        | Nov 104.73 .12 = 143.74 .12 = 21.56 21.22          | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.31<br>0.54<br>0.71<br>0.71<br>0.71<br>21.93 | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(44)<br>(44)<br>(44)<br>(44  |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54<br>Water storage lo<br>If the vessel con | In twater u<br>Jan<br>in litres pe<br>108.69<br>of hot wate<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) incluoss:<br>er's declare<br>er s declare<br>factor from<br>rom water s<br>0 in (55)<br>oss calculate<br>21.93<br>tains dedica                  | sage in litr           Feb           r day for ea           104.73           r used = 4           140.97           and           21.15           ading any s           d loss factor           n Table 2b           torage (kW)           ed for each           19.81           ated solar s           19.81 | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>vh/day) (48<br>month (59<br>21.93<br>storage or c<br>21.93 | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>126.82<br>126.82<br>(hrs storage<br>(kWh/day)<br>8) x (49)<br>5) x (41)m<br>21.22<br>ledicated W<br>21.22 | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>re within sam<br>21.93<br>/WHRS (56)r<br>21.93  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel<br>21.22<br>n x [(47) -<br>21.22 | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60<br>14.60<br>21.93<br>Vs] ÷ (47),<br>21.93 | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75<br>16.75<br>21.93<br>else (56)<br>21.93 | Sep<br>96.83<br>112.99<br>16.95<br>21.22<br>21.22 | Oct<br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75<br>21.93        | Nov 104.73 .12 =                                   | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.31<br>0.54<br>0.71<br>0.71<br>0.71<br>21.93 | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(44)<br>(44)<br>(47)<br>(47)<br>(48)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)<br>(55)<br>(56) |

| Combi loss for e  | 22.20   | 24.04  | 22.26   | 22.54   | 22.26   | 22.54  | 22.26  | 22.26  | 22.54   | 22.26  | 22.54   |  |
|---|---|--|---|---|---|--|--|--|---|--|---|--|
| Combi loss for e  | 23.26   | 21.01  | 23.26   | 22.51   | 23.26   | 22.51  | 23.26  | 23.26  | 22.51   | 23.26  | 22.51   | 23.26 (59)   |
|   | each month  | from Table   | 3a, 3b or 3   | С   |   |  |  |  |   |  |   |  |
|   | 0.00  | 0.00   | 0.00  | 0.00  | 0.00  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00  | 0.00 (61)  |
| Total heat requ   | ired for wat  | er heating   | calculated f  | or each mo  | onth 0.85 x   | (45)m + (46  | 6)m + (57)r  | m + (59)m  | + (61)m   |  |   |  |
|   | 206.37  | 181.79   | 190.66  | 170.55  | 166.88  | 148.74   | 142.50   | 156.85   | 156.73  | 176.87   | 187.47  | 201.28 (62)  |
| Solar DHW inpu  | t calculated  | using App  | endix G or A  | Appendix H  |   |  |  | 1  |   |  | 1   | · · ·  |
| 00:0: 2::::po   |   | 0.00   |   |   | 0.00  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00  |  |
| <b>a f</b>  | 0.00  | 0.00   | 0.00  | 0.00  |   | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00  | 0.00 (03)  |
| Output from wa  | iter heater f   | for each mo  | onth (kWh/i   | month) (62  | 2)m + (63)m<br>-  | 1  |  | i  |   |  |   |  |
|   | 206.37  | 181.79   | 190.66  | 170.55  | 166.88  | 148.74   | 142.50   | 156.85   | 156.73  | 176.87   | 187.47  | 201.28   |
|   |   |  |   |   |   |  |  |  |   | ∑(64)1   | .12 =   | 2086.69 <b>(64)</b>  |
| Heat gains from   | water heat  | ing (kWh/r   | month) 0.2  | 5 × [0.85 ×   | (45)m + (61   | .)m] + 0.8 ×   | [(46)m + (   | 57)m + (59   | )m]   |  |   |  |
|   | 89.75   | 79.53  | 84.52   | 77.15   | 76.61   | 69.90  | 68.51  | 73.28  | 72.56   | 79.94  | 82.78   | 88.05 (65)   |
|   |   | 1  |   |   |   |  |  |  |   | 1  |   |  |
| 5. Internal gai   | ns  |  |   |   |   |  |  |  |   |  |   |  |
|   | Jan   | Feb  | Mar   | Apr   | May   | Jun  | Jul  | Aug  | Sep   | Oct  | Nov   | Dec  |
| Metabolic gains   | (Table 5)   |  |   | -   | -   |  |  | -  |   |  |   |  |
| inclusione guine  |   | 120.01   | 120.01  | 120.01  | 120.01  | 120.01   | 120.01   | 120.01   | 120.01  | 120.01   | 120.01  | 120.01 (00)  |
|   | 136.01  | 136.01   | 136.01  | 136.01  | 136.01  | 136.01   | 136.01   | 136.01   | 136.01  | 136.01   | 136.01  | 136.01 (66)  |
| Lighting gains (  | calculated in   | Appendix   | L, equation   | L9 or L9a),   | also see Ta   | ible 5   |  |  | _   |  |   |  |
|   | 22.56   | 20.04  | 16.30   | 12.34   | 9.22  | 7.79   | 8.41   | 10.93  | 14.68   | 18.64  | 21.75   | 23.19 (67)   |
| Appliance gains   | (calculated   | in Append  | ix L, equatio   | on L13 or L   | 13a), also se   | ee Table 5   |  |  |   |  |   |  |
|   | 253.05  | 255.68   | 249.06  | 234.97  | 217.19  | 200.48   | 189.31   | 186.69   | 193.31  | 207.39   | 225.17  | 241.89 (68)  |
| Cooking gains (   | calculated in   | n Appendix   | L, equation   | L15 or L15  | a), also see  | Table 5  |  |  |   |  |   | * * * *  |
| 0.01  | 26.60   | 26.60  | 26.60   | 26.60   | 26.60   | 26.60  | 26.60  | 26.60  | 26.60   | 26.60  | 26.60   | 26.60 (60)   |
| Duran and fam.  |   | 50.00  | 50.00   | 50.00   | 50.00   | 50.00  | 50.00  | 50.00  | 50.00   | 50.00  | 50.00   | 50.00 (09)   |
| Pump and fan g  | ains (Table :   | 5a)  | 1   | 1   | 1   |  |  |  |   | 1  | 1   |  |
|   | 3.00  | 3.00   | 3.00  | 3.00  | 3.00  | 3.00   | 3.00   | 3.00   | 3.00  | 3.00   | 3.00  | 3.00 (70)  |
| Losses e.g. evap  | oration (Ta   | ble 5)   |   |   |   |  |  |  |   |  |   |  |
|   | -108.81   | 100.01   | -108.81   | -108.81   | -108.81   | -108.81  | -108.81  | -108.81  | -108.81   | -108.81  | -108.81   | -108.81 (71)   |
|   | 100.01  | -108.81  |   |   |   |  |  | •  |   |  | •   |  |
| Water heating s   | gains (Table  | 5)   |   |   |   |  |  |  |   |  |   |  |
| Water heating §   | gains (Table  | 5)   | 113 60  | 107.16  | 102.98  | 97.09  | 92.08  | 08.10  | 100 77  | 107.44   | 11/ 07  | 118 35 (72)  |
| Water heating g   | gains (Table  | 5)<br>118.34   | 113.60  | 107.16  | 102.98  | 97.09  | 92.08  | 98.49  | 100.77  | 107.44   | 114.97  | 118.35 (72)  |
| Water heating g<br>Total internal g   | gains (Table<br>120.63<br>ains (66)m -  | 5)<br>118.34<br>+ (67)m + (6   | 113.60<br>68)m + (69)   | 107.16<br>m + (70)m   | 102.98<br>+ (71)m + (7  | 97.09<br>72)m  | 92.08  | 98.49  | 100.77  | 107.44   | 114.97  | 118.35 (72)  |
| Water heating g<br>Total internal g   | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | 5)<br>118.34<br>+ (67)m + (0<br>460.86   | 113.60<br>68)m + (69)<br>445.76   | 107.16<br>m + (70)m<br>421.27   | 102.98<br>+ (71)m + (7<br>396.19  | 97.09<br>72)m<br>372.15  | 92.08<br>356.61  | 98.49<br>362.92  | 100.77<br>375.56  | 107.44<br>400.27   | 114.97<br>428.70  | 118.35       (72)         450.23       (73)  |
| Water heating g<br>Total internal g   | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | 5)<br>118.34<br>+ (67)m + (0<br>460.86   | 113.60<br>68)m + (69)<br>445.76   | 107.16<br>m + (70)m<br>421.27   | 102.98<br>+ (71)m + (7<br>396.19  | 97.09<br>72)m<br>372.15  | 92.08<br>356.61  | 98.49<br>362.92  | 100.77<br>375.56  | 400.27   | 114.97<br>428.70  | 118.35       (72)         450.23       (73)  |
| Water heating g<br>Total internal g<br>6. Solar gains   | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | 5)<br>118.34<br>+ (67)m + (0<br>460.86   | 113.60<br>68)m + (69)<br>445.76   | 107.16<br>m + (70)m<br>421.27   | 102.98<br>+ (71)m + (7<br>396.19  | 97.09<br>72)m<br>372.15  | 92.08  | 98.49  | 375.56  | 400.27   | 114.97<br>428.70  | 118.35 (72)<br>450.23 (73)   |
| Water heating g<br>Total internal g<br>6. Solar gains   | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | 5)<br>118.34<br>+ (67)m + (0<br>460.86   | 113.60<br>68)m + (69)<br>445.76<br>Access f   | 107.16<br>m + (70)m<br>421.27   | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup>  | 97.09<br>72)m<br>372.15<br>Sola  | 92.08<br>356.61<br>ar flux   | 98.49<br>362.92  | 8<br>g  | 107.44<br>400.27   | 114.97<br>428.70  | 118.35 (72)<br>450.23 (73)<br>Gains<br>W   |
| Water heating g<br>Total internal g<br>6. Solar gains   | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | -108.81<br>5)<br>118.34<br>+ (67)m + (0<br>460.86  | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table  | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d   | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup>  | 97.09<br>72)m<br>372.15<br>Sola<br>W   | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup>   | 98.49<br>362.92<br>spec  | g<br>cific data<br>Fable 6b   | 107.44<br>400.27<br>FF<br>specific c<br>or Table   | 114.97<br>428.70<br>data  | 118.35 (72)<br>450.23 (73)<br>Gains<br>W   |
| Water heating g<br>Total internal g<br>6. Solar gains   | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | 5)<br>118.34<br>+ (67)m + (0<br>460.86   | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table  | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d   | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup>  | 97.09<br>72)m<br>372.15<br>Sola<br>W   | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup>   | 98.49<br>362.92<br>spe   | g<br>cific data<br>rable 6b   | 107.44<br>400.27<br>FF<br>specific c<br>or Table   | 114.97<br>428.70<br>data<br>6c  | 118.35 (72)<br>450.23 (73)<br>Gains<br>W   |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast  | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | 5)<br>118.34<br>+ (67)m + ((<br>460.86   | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7   | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [  | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59   | 97.09<br>72)m<br>372.15<br>Sola<br>W<br>X 3  | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x   | 98.49<br>362.92<br>spec<br>or<br>0.9 x   | 8<br>cific data<br>Table 6b<br>0.72 ×   | 107.44<br>400.27<br>FF<br>specific c<br>or Table   | 114.97<br>428.70<br>data<br>6c<br>= = [   | 118.35 (72)<br>450.23 (73)<br>Gains<br>W<br>287.72 (77)  |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South   | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | -108.81<br>5)<br>118.34<br>+ (67)m + ((<br>460.86  | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table  | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [<br>7 x [   | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60  | 97.09<br>72)m<br>372.15<br>Sola<br>X<br>x 3<br>x 3<br>x 4  | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x   | 98.49<br>362.92<br>spectrum<br>or<br>0.9 x<br>0.9 x  | 100.77         375.56         g         cific data         Table 6b         0.72       x         0.72       x   | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80   | 114.97<br>428.70<br>data<br>6c<br>= = [<br>= = [  | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)   |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast  | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | 5)<br>118.34<br>+ (67)m + (0<br>460.86   | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7  | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [<br>7 x [<br>7 x [  | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80  | 97.09<br>72)m<br>372.15<br>Sola<br>X<br>X<br>X<br>X<br>4<br>X<br>X                                     | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x   | 98.49<br>362.92<br>sper<br>or<br>0.9 x<br>0.9 x<br>0.9 x   | 100.77         375.56         g         cific data         Fable 6b         0.72       ×         0.72       ×         0.72       ×  | 107.44           400.27           FF           specific c           or Table           0.80           0.80           0.80  | 114.97<br>428.70<br>data<br>6c<br>= [<br>= [<br>= ]<br>= [  | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)  |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest   | gains (Table<br>120.63<br>ains (66)m -<br>463.04  | -108.81<br>5)<br>118.34<br>+ (67)m + ((<br>460.86  | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7  | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [  | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51   | 97.09<br>72)m<br>372.15<br>Sola<br>X<br>X<br>X<br>4<br>X<br>X<br>1<br>X<br>1<br>X                      | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x   | 98.49<br>362.92<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x  | 100.77         375.56         g         cific data         Table 6b         0.72       x         0.72       x | 107.44           400.27           FF           specific c           or Table           a           0.80           a           0.80           a           0.80           a           0.80           a | 114.97<br>428.70<br>428.70<br>56<br>= = [<br>= = [<br>= = [   | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)   |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w   | gains (Table<br>120.63<br>ains (66)m -<br>463.04<br>463.04  | 108.81<br>5)<br>118.34<br>+ (67)m + (0<br>460.86   | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7   | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [  | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51   | 97.09<br>72)m<br>372.15<br>Sola<br>X 3<br>X 4<br>X 1<br>X 1<br>X 1                                     | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x   | 98.49<br>362.92<br>spec<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x  | 100.77         375.56         g         cific data         Table 6b         0.72       x         0.72       x         0.72       x         0.72       x         0.72       x  | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80<br>0.80<br>0.80   | 114.97<br>428.70<br>data<br>e 6c<br>= [<br>= [<br>= [<br>= ]<br>= [   | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)   |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w   | aits Σ(74)m   | -108.81<br>5)<br>118.34<br>+ (67)m + (0<br>460.86  | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7<br>1418.71   | 107.16<br>m + (70)m<br>421.27<br><b>factor</b><br>6d<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [   | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51<br>2157.22                                    | 97.09<br>72)m<br>372.15<br>Sola<br>X<br>X<br>X<br>X<br>X<br>X<br>1<br>X<br>1<br>X<br>1<br>X<br>1       | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>2086.32                                | 98.49<br>362.92<br>spec<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x<br>1848.92  | 100.77         375.56         g         cific data         Fable 6b         0.72       ×         0.72       ×         0.72       ×         0.72       ×         0.72       ×         1565.94  | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80<br>0.80<br>0.80<br>1118.63  | 114.97<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>400<br>400<br>400<br>400<br>400<br>400<br>400<br>400<br>400<br>4  | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)   |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthEast<br>Solar gains in w   | ains (Table<br>120.63<br>ains (66)m -<br>463.04<br>463.04<br>463.04<br>577.01<br>ernal and so   | 108.81<br>5)<br>118.34<br>+ (67)m + ((<br>460.86<br>460.86<br>(82)m<br>1000.25<br>blar (73)m +   | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7<br>1418.71<br>+ (83)m  | 107.16<br>m + (70)m<br>421.27<br>Gactor<br>6d<br>7 x [<br>7 x [   | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51<br>2157.22                                    | 97.09<br>72)m<br>372.15<br>Sola<br>X<br>X<br>X<br>X<br>4<br>X<br>X<br>1<br>X<br>1<br>X<br>1<br>2181.15 | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>2086.32                                | 98.49<br>362.92<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x<br>1848.92  | 100.77         375.56         g         cific data         Table 6b         0.72       x         0.72       x         0.72       x         0.72       x         0.72       x         1565.94  | 107.44<br>400.27<br><b>FF</b><br>specific c<br>or Table<br>0.80<br>0.80<br>0.80<br>11118.63  | 114.97<br>428.70<br>428.70<br>= [<br>= [<br>= [<br>= [<br>= ] = [<br>= ]<br>694.19  | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)         491.86       (83)   |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int                                      | atts $Σ(74)$ m<br>577.01<br>20.63<br>20.63<br>20.63<br>463.04<br>463.04   | 108.81<br>5)<br>118.34<br>+ (67)m + (f<br>460.86<br>460.86<br>(82)m<br>1000.25<br>plar (73)m +   | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7<br>1418.71<br>+ (83)m  | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [<br>7 | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51<br>2157.22                                    | 97.09<br>72)m<br>372.15<br>Sola<br>X<br>X<br>X<br>X<br>1<br>X<br>1<br>2181.15                          | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>2086.32                                | 98.49<br>362.92<br>spee<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x<br>1848.92  | 100.77         375.56         g         cific data         Table 6b         0.72       x         0.72       x         0.72       x         1565.94  | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80<br>0.80<br>0.80<br>1118.63  | 114.97<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70<br>428.70  | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)         491.86       (83)   |
| Water heating a<br>Total internal ga<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int                                     | atts Σ(74)m<br>577.01<br>1040.05  | 108.81<br>5)<br>118.34<br>+ (67)m + (0<br>460.86<br>460.86<br>(82)m<br>1000.25<br>blar (73)m +<br>1461.12  | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7<br>1418.71<br>+ (83)m<br>1864.47   | 107.16<br>m + (70)m<br>421.27<br>Gactor<br>6d<br>7 x [<br>7 x [] x [<br>7 x [<br>7 x [<br>7 x [] x [<br>7 x [] x [  | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51<br>2157.22<br>2553.41                         | 97.09<br>72)m<br>372.15<br>Sola<br>X 30<br>X 40<br>X 1<br>X 1<br>2181.15<br>2553.31                    | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>2086.32<br>2442.93                     | 98.49<br>362.92<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>1848.92<br>2211.84  | 100.77         375.56         g         cific data         Fable 6b         0.72       ×         0.72       ×         0.72       ×         0.72       ×         1565.94       1941.50   | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80<br>0.80<br>0.80<br>0.80<br>11118.63<br>1518.90  | 114.97<br>428.70<br>428.70<br>428.70<br>= [<br>] = [<br>] = [<br>] = [<br>694.19<br>1122.90   | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)         491.86       (83)         942.09       (84)   |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int                                      | 100.01         gains (Table         120.63         ains (66)m         463.04         463.04         577.01         ernal and soc         1040.05      | 108.81<br>5)<br>118.34<br>+ (67)m + (0<br>460.86<br>460.86<br>(82)m<br>1000.25<br>olar (73)m +<br>1461.12  | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7<br>1418.71<br>+ (83)m<br>1864.47<br>ing season   | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [<br>7 x ]  | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51<br>2157.22<br>2553.41                         | 97.09<br>72)m<br>372.15<br>Sola<br>X 3<br>X 4<br>X 1<br>X 1<br>2181.15<br>2553.31                      | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>2086.32<br>2442.93                     | 98.49<br>362.92<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x<br>1848.92<br>2211.84   | 100.77         375.56         g         cific data         Table 6b         0.72       ×         0.72       ×         0.72       ×         0.72       ×         1565.94       1941.50   | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80<br>0.80<br>0.80<br>1118.63<br>1518.90   | 114.97<br>428.70<br>428.70<br>= [<br>] = [<br>] = [<br>] = [<br>694.19<br>1122.90   | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)         491.86       (83)         942.09       (84)   |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int<br>7. Mean intern                    | gains (Table<br>120.63<br>ains (66)m -<br>463.04<br>463.04<br>463.04<br>463.04<br>577.01<br>ernal and so<br>1040.05<br>hal tempera                    | 108.81<br>5)<br>118.34<br>+ (67)m + ((<br>460.86<br>460.86<br>(82)m<br>1000.25<br>olar (73)m +<br>1461.12<br>ture (heati   | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7<br>1418.71<br>+ (83)m<br>1864.47<br>ing season)  | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [<br>7 x ]  | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51<br>2157.22<br>2553.41                         | 97.09<br>72)m<br>372.15<br>Sola<br>X<br>X<br>X<br>X<br>1<br>X<br>1<br>X<br>1<br>2181.15<br>2553.31     | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>1.28 x<br>2086.32<br>2442.93 | 98.49<br>362.92<br>spec<br>or<br>0.9 x<br>0.9 x0<br>0.9 x0<br>00 0.0 x000000000000000 | 100.77         375.56         g         cific data         Table 6b         0.72       x         0.72       x         0.72       x         1565.94         1941.50  | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80<br>0.80<br>0.80<br>1118.63<br>1518.90   | 114.97<br>428.70<br>428.70<br>data<br>6c<br>= [<br>] = [<br>] = [<br>] = [<br>] 694.19  | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)         491.86       (83)         942.09       (84)   |
| Water heating a<br>Total internal ga<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int<br>7. Mean intern<br>Temperature da | gains (Table<br>120.63<br>ains (66)m<br>463.04<br>463.04<br>463.04<br>463.04<br>577.01<br>ernal and sc<br>1040.05<br>hal temperation<br>uring heating | 108.81<br>5)<br>118.34<br>+ (67)m + ((<br>460.86<br>460.86<br>460.86<br>1000.25<br>1000.25<br>1000.25<br>1000.25<br>1000.25<br>1000.25<br>1461.12<br>ture (heati<br>g periods in | 113.60<br>68)m + (69)<br>445.76<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7<br>0.7<br>1418.71<br>+ (83)m<br>1864.47<br>ing season)<br>n the living a   | 107.16<br>m + (70)m<br>421.27<br>Gactor<br>6d<br>7 x [<br>7 x ]<br>7 x [<br>7 x [<br>7 x ]<br>7 x [<br>7 x ] 7 x [<br>7 x ]<br>7 x [<br>7 x ] 7 x ]<br>7 x [<br>7 x ] 7 x ]<br>7 x [<br>7 x ] 7 x ] 7 x [<br>7 x ] 7 x ] 7 x [<br>7 x ] 7 x ] 7                            | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51<br>2157.22<br>2553.41                         | 97.09<br>72)m<br>372.15<br>Sola<br>X 30<br>X 40<br>X 1<br>X 1<br>2181.15<br>2553.31                    | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>2086.32<br>2442.93                     | 98.49<br>362.92<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>1848.92<br>2211.84  | 100.77         375.56         g         cific data         Fable 6b         0.72         x         0.72         x         0.72         x         1565.94         1941.50  | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80<br>0.80<br>0.80<br>0.80<br>11118.63<br>1518.90  | 114.97<br>428.70<br>428.70<br>428.70<br>= [<br>] = [ ] = [<br>] = [] = [  | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)         942.09       (84)         91.86       (83)         942.09       (84)                        |
| Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int<br>7. Mean intern<br>Temperature du  | gains (Table<br>120.63<br>ains (66)m<br>463.04<br>463.04<br>463.04<br>577.01<br>ernal and sc<br>1040.05<br>hal temperation<br>uring heating<br>Jan    | 108.81<br>5)<br>118.34<br>+ (67)m + (f<br>460.86<br>460.86<br>1460.86<br>1000.25<br>olar (73)m +<br>1461.12<br>ture (heati<br>g periods in<br>Feb                                | 113.60         68)m + (69)         445.76         Access f         Table         0.7         1418.71         + (83)m         1864.47         ing season)         m the living a         Mar | 107.16<br>m + (70)m<br>421.27<br>factor<br>6d<br>7 x [<br>7 x ]<br>7 x [<br>7 x [<br>7 x ]<br>7 x ]<br>7 x [<br>7 x ]<br>7 x ]<br>7 x ]<br>7 x [<br>7 x ]<br>7 | 102.98<br>+ (71)m + (7<br>396.19<br>Area<br>m <sup>2</sup><br>19.59<br>10.60<br>9.80<br>10.51<br>2157.22<br>2553.41<br>- able 9, Th1<br>May | 97.09<br>72)m<br>372.15<br>Sola<br>W<br>X 3<br>X 4<br>X 1<br>X 1<br>2181.15<br>2553.31<br>(°C)<br>Jun  | 92.08<br>356.61<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>2086.32<br>2442.93                     | 98.49<br>362.92<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x<br>1848.92<br>2211.84<br>Aug  | 100.77         375.56         g         cific data         Table 6b         0.72         0.72         0.72         1565.94         1941.50  | 107.44<br>400.27<br>FF<br>specific c<br>or Table<br>0.80<br>0.80<br>0.80<br>1118.63<br>1518.90<br>Oct  | 114.97<br>428.70<br>428.70<br>428.70<br>= [<br>] = [ ] = [<br>] = [] = [ | 118.35       (72)         450.23       (73)         Gains       (73)         287.72       (77)         197.82       (78)         44.14       (75)         47.33       (81)         991.86       (83)         942.09       (84)         21.00       (85)         Dec       (72) |

|                    | 0.98           | 0.94          | 0.84         | 0.66          | 0.48         | 0.33         | 0.24   | 0.28   | 0.47   | 0.78          | 0.95    | 0.99    | (86)         |
|--------------------|----------------|---------------|--------------|---------------|--------------|--------------|--------|--------|--------|---------------|---------|---------|--------------|
| Mean internal t    | emp of livin   | g area T1 (s  | teps 3 to 7  | in Table 9c   | :)           |              |        |        |        |               |         |         |              |
|                    | 20.06          | 20.36         | 20.64        | 20.84         | 20.92        | 20.93        | 20.94  | 20.94  | 20.92  | 20.78         | 20.37   | 20.00   | (87)         |
| Temperature du     | uring heating  | g periods in  | the rest of  | f dwelling fi | rom Table 9  | , Th2(°C)    |        |        |        | •             |         | ·       | _            |
|                    | 19.76          | 19.76         | 19.76        | 19.77         | 19.78        | 19.79        | 19.79  | 19.79  | 19.78  | 19.78         | 19.77   | 19.77   | (88)         |
| Utilisation facto  | r for gains f  | or rest of dv | velling n2,  | m             | II           |              | I      |        |        |               | 1       | 1       |              |
|                    | 0.98           | 0.92          | 0.80         | 0.61          | 0.42         | 0.27         | 0.18   | 0.21   | 0 39   | 0.72          | 0.94    | 0.98    | (89)         |
| Mean internal t    | emperature     | in the rest   | of dwelling  | T2 (follow    | stens 3 to - | 7 in Table   | 9c)    | 0.21   | 0.55   | 0.72          | 0.54    | 0.50    | ] (03)       |
| Wiedliningerhaft   |                | 18.06         | 10.24        | 10 50         | 10.67        | 10.60        | 10.70  | 10.70  | 10.69  | 10.54         | 10.00   | 19.46   |              |
| Living and freed   | 10.54          | 10.90         | 19.54        | 19.59         | 19.07        | 19.09        | 19.70  | 19.70  | 19.08  | 19.54         | (4)     | 0.27    | ] (90)       |
| Living dred indet  | .1011          | forthowh      | ala duyallia | ~ fl A v T1 i | (1 f( A) v T | - <b>-</b> - |        |        | L      | ving area -   | (4) =   | 0.37    | ] (91)       |
| wean internal u    |                |               |              | g ILA X I I + |              | 2            | 00.17  |        |        | 1 10 00       | 10 -0   | 1 40 00 |              |
|                    | 19.10          | 19.47         | 19.82        | 20.05         | 20.13        | 20.15        | 20.15  | 20.15  | 20.14  | 19.99         | 19.50   | 19.03   | <b>(92)</b>  |
| Apply adjustme     | nt to the me   | ean internal  | temperati    | ure from Ta   | ble 4e whe   | re appropi   | riate  |        |        |               |         | 1       | 7            |
|                    | 18.95          | 19.32         | 19.67        | 19.90         | 19.98        | 20.00        | 20.00  | 20.00  | 19.99  | 19.84         | 19.35   | 18.88   | (93)         |
| 8 Space heati      | ag requirem    | ont           |              |               |              |              |        | ·      |        |               |         |         |              |
| 0. Space fication  | lan            | Tab           | Mor          | A             | May          | 1            | Int    | A      | Ear    | Oct           | Neu     | Dec     |              |
|                    | Jan            | reb           | IVIAL        | Apr           | iviay        | Jun          | Jui    | Aug    | Sep    | UCI           | NOV     | Dec     |              |
| Utilisation facto  | r for gains, i | ηm<br>I i i i |              |               |              |              |        |        |        |               |         | 1       | ٦            |
|                    | 0.97           | 0.91          | 0.80         | 0.62          | 0.43         | 0.28         | 0.19   | 0.22   | 0.40   | 0.73          | 0.93    | 0.98    | ] (94)       |
| Useful gains, ηn   | nGm, W (94     | l)m x (84)m   |              | 1             |              |              |        |        |        |               |         | 1       | 7            |
|                    | 1009.88        | 1332.20       | 1489.19      | 1401.63       | 1104.65      | 722.96       | 456.46 | 482.28 | 784.37 | 1105.63       | 1047.80 | 922.65  | (95)         |
| Monthly averag     | e external t   | emperature    | from Tabl    | e U1          |              |              |        |        |        |               |         |         | _            |
|                    | 4.30           | 4.90          | 6.50         | 8.90          | 11.70        | 14.60        | 16.60  | 16.40  | 14.10  | 10.60         | 7.10    | 4.20    | (96)         |
| Heat loss rate for | or mean inte   | ernal tempe   | rature, Lm   | , W [(39)m    | x [(93)m - ( | (96)m]       |        |        |        |               |         |         |              |
|                    | 2018.57        | 1983.58       | 1807.53      | 1495.18       | 1122.58      | 725.06       | 456.70 | 482.75 | 793.92 | 1254.04       | 1668.95 | 2006.49 | (97)         |
| Space heating re   | equirement,    | , kWh/mont    | th 0.024 x   | [(97)m - (9   | 5)m] x (41)r | n            |        |        |        |               |         |         |              |
|                    | 750.47         | 437.73        | 236.85       | 67.35         | 13.34        | 0.00         | 0.00   | 0.00   | 0.00   | 110.42        | 447.23  | 806.38  | ]            |
|                    |                |               |              |               |              |              |        |        | ∑(9    | 8)15, 10      | .12 = 2 | 2869.76 | (98)         |
| Space heating re   | equirement     | kWh/m²/ye     | ar           |               |              |              |        |        |        | (98)          | ÷ (4)   | 29.28   | (99)         |
|                    |                |               |              |               |              |              |        |        |        | ( )           | .,      |         |              |
| 9a. Energy req     | uirements -    | individual    | heating sys  | stems inclu   | ding micro   | -CHP         |        |        |        |               |         |         |              |
| Space heating      |                |               |              |               |              |              |        |        |        |               |         |         |              |
| Fraction of space  | e heat from    | secondary/    | /suppleme    | ntary syste   | m (table 11  | )            |        |        |        |               |         | 0.00    | (201)        |
| Fraction of space  | e heat from    | main syste    | m(s)         |               |              |              |        |        |        | 1 - (20       | 01) =   | 1.00    | (202)        |
| Fraction of spac   | e heat from    | main syste    | m 2          |               |              |              |        |        |        |               |         | 0.00    | (202)        |
| Fraction of total  | l space heat   | from main     | system 1     |               |              |              |        |        | (20    | 02) x [1- (20 | 3)] =   | 1.00    | (204)        |
| Fraction of total  | l space heat   | from main     | system 2     |               |              |              |        |        |        | (202) x (20   | 03) =   | 0.00    | _<br>] (205) |
| Efficiency of ma   | in system 1    | (%)           | ,            |               |              |              |        |        |        | , , , ,       | ,       | 92.70   | ] (206)      |
|                    | lan            | Feb           | Mar          | Apr           | May          | Jun          | Jul    | Aug    | Sep    | Oct           | Nov     | Dec     | ] ()         |
| Space heating fu   | iel (main sv   | stem 1) kW    | /h/month     |               | ,            |              |        |        | b      | •••           |         |         |              |
| opuce neuting n    |                | 472.20        | 255 50       | 72.66         | 14.20        | 0.00         | 0.00   | 0.00   | 0.00   | 110 11        | 102 15  | 060.00  | 1            |
|                    | 809.50         | 472.20        | 255.50       | 72.00         | 14.59        | 0.00         | 0.00   | 0.00   | 0.00   | 119.11        | 402.45  | 009.00  |              |
|                    |                |               |              |               |              |              |        |        | 2(21   | 1)15, 10      | .12 =   | 3095.75 | ] (211)      |
| water heating      |                |               |              |               |              |              |        |        |        |               |         |         |              |
| Efficiency of wa   | ter heater     | ,             |              |               |              |              | 1      |        |        |               |         | 1       | 7            |
|                    | 87.76          | 86.87         | 85.19        | 82.36         | 80.30        | 79.60        | 79.60  | 79.60  | 79.60  | 83.40         | 86.85   | 87.94   | ] (217)      |
| Water heating f    | uel, kWh/m     | onth          |              |               |              |              | 1      |        |        | 1             |         |         | -            |
|                    | 235.16         | 209.25        | 223.80       | 207.08        | 207.81       | 186.86       | 179.02 | 197.05 | 196.89 | 212.08        | 215.86  | 228.89  |              |
|                    |                |               |              |               |              |              |        |        |        | ∑(219a)1      | .12 = 2 | 2499.74 | (219)        |
|                    |                |               |              |               |              |              |        |        |        |               |         |         |              |

#### Annual totals

Water heating fuel

Space heating fuel - main system 1

| 3095.75 |  |
|---------|--|
|         |  |
| 2499.74 |  |

Electricity for pumps, fans and electric keep-hot (Table 4f)

| mechanical ventilation fans - balanced, extract or positive input from outside | 167.09                             |         | (230a) |
|--|------------------------------------|---------|--------|
| central heating pump or water pump within warm air heating unit                | 30.00                              |         | (230c) |
| boiler flue fan  | 45.00                              |         | (230e) |
| Total electricity for the above, kWh/year                                      |                                    | 242.09  | (231)  |
| Electricity for lighting (Appendix L)  |                                    | 398.41  | (232)  |
| Total delivered energy for all uses  | (211)(221) + (231) + (232)(237b) = | 6235.99 | (238)  |

Total delivered energy for all uses

#### 10a. Fuel costs - individual heating systems including micro-CHP

|   | Fuel<br>kWh/year |   | Fuel price   |              | Fuel<br>cost £/year |       |
|---|------------------|---|--------------|--------------|---------------------|-------|
| Space heating - main system 1                     | 3095.75          | x | 3.48         | x 0.01 =     | 107.73              | (240) |
| Water heating                                     | 2499.74          | x | 3.48         | x 0.01 =     | 86.99               | (247) |
| Pumps and fans                                    | 242.09           | x | 13.19        | x 0.01 =     | 31.93               | (249) |
| Electricity for lighting                          | 398.41           | x | 13.19        | x 0.01 =     | 52.55               | (250) |
| Additional standing charges                       |                  |   |              |              | 120.00              | (251) |
| Total energy cost                                 |                  |   | (240)(242) + | (245)(254) = | 399.21              | (255) |
| 11a. SAP rating - individual heating systems incl | uding micro-CHP  |   |              |              |                     |       |
| Energy cost deflator (Table 12)                   |                  |   |              |              | 0.42                | (256) |
| Energy cost factor (ECF)                          |                  |   |              | [            | 1.17                | (257) |
| SAP value   |                  |   |              |              | 83.64               |       |
| SAP rating (section 13)                           |                  |   |              |              | 84                  | (258) |
| SAP band  |                  |   |              |              | В                   |       |

#### 12a. CO<sub>2</sub> emissions - individual heating systems including micro-CHP

|                                 | Energy<br>kWh/year |   | Emission factor<br>kg CO₂/kWh |                 | Emissions<br>kg CO <sub>2</sub> /year |       |
|---------------------------------|--------------------|---|-------------------------------|-----------------|---------------------------------------|-------|
| Space heating - main system 1   | 3095.75            | x | 0.22                          | =               | 668.68                                | (261) |
| Water heating                   | 2499.74            | x | 0.22                          | =               | 539.94                                | (264) |
| Space and water heating         |                    |   | (261) + (262) +               | (263) + (264) = | 1208.63                               | (265) |
| Pumps and fans                  | 242.09             | х | 0.52                          | =               | 125.64                                | (267) |
| Electricity for lighting        | 398.41             | х | 0.52                          | =               | 206.78                                | (268) |
| Total CO <sub>2</sub> , kg/year |                    |   |                               | (265)(271) =    | 1541.05                               | (272) |
| Dwelling CO₂ emission rate      |                    |   |                               | (272) ÷ (4) =   | 15.72                                 | (273) |
| El value                        |                    |   |                               |                 | 85.56                                 | ]     |
| El rating (section 14)          |                    |   |                               |                 | 86                                    | (274) |
| El band                         |                    |   |                               |                 | В                                     | ]     |

#### 13a. Primary energy - individual heating systems including micro-CHP

|                               | Energy<br>kWh/year |     | Primary factor  |                 | Primary Energy<br>kWh/year | ,     |
|-------------------------------|--------------------|-----|-----------------|-----------------|----------------------------|-------|
| Space heating - main system 1 | 3095.75            | ] x | 1.22            | =               | 3776.82                    | (261) |
| Water heating                 | 2499.74            | ] x | 1.22            | =               | 3049.68                    | (264) |
| Space and water heating       |                    |     | (261) + (262) + | (263) + (264) = | 6826.50                    | (265) |
| Pumps and fans                | 242.09             | ] x | 3.07            | =               | 743.20                     | (267) |
| Electricity for lighting      | 398.41             | ] x | 3.07            | =               | 1223.13                    | (268) |

Primary energy kWh/year

Dwelling primary energy rate kWh/m2/year

| 8792.84 | (272) |
|---------|-------|
| 89.72   | (273) |



| Assessor name            | Mr Jo           | ohn Simpson        |               |               |               |                |          | Assessor nun                 | nber           | 3722   |                   |           |
|--------------------------|-----------------|--------------------|---------------|---------------|---------------|----------------|----------|------------------------------|----------------|--------|-------------------|-----------|
| Client                   |                 |                    |               |               |               |                |          | Last modified                | ł              | 19/11, | /2014             |           |
| Address                  | Unit            | 4.02 Marine Ico    | es Haversto   | ock Hill, Loi | ndon, NW3     | 2BL            |          |                              |                |        |                   |           |
|                          |                 |                    |               |               |               |                |          |                              |                |        |                   |           |
| 1. Overall dwelling d    | limensions      |                    |               |               |               |                |          |                              |                |        |                   |           |
|                          |                 |                    |               | Д             | vrea (m²)     |                | ľ        | Average storey<br>height (m) | ,              | Vo     | lume (m³)         |           |
| Lowest occupied          |                 |                    |               |               | 100.90        | (1a) x         |          | 2.60                         | ] (2a) =       |        | 262.34            | (3a)      |
| Total floor area         |                 | (1a) + (1b) + (1   | c) + (1d)(    | 1n) =         | 100.90        | (4)            |          |                              |                |        |                   |           |
| Dwelling volume          |                 |                    |               |               |               |                |          | (3a) + (3b) + (3             | c) + (3d)(3    | n) =   | 262.34            | (5)       |
| 2. Ventilation rate      |                 |                    |               |               |               |                |          |                              |                |        |                   |           |
|                          |                 |                    |               |               |               |                |          |                              |                | m³     | ' per hour        |           |
| Number of chimneys       |                 |                    |               |               |               |                | Г        | 0                            | x 40 =         |        | 0                 | (6a)      |
| Number of open flues     |                 |                    |               |               |               |                | Ē        | 0                            | x 20 =         |        | 0                 | (6b)      |
| Number of intermitte     | nt fans         |                    |               |               |               |                | Ē        | 0                            | x 10 =         |        | 0                 | (7a)      |
| Number of passive ve     | nts             |                    |               |               |               |                | Ē        | 0                            | x 10 =         |        | 0                 | /<br>(7b) |
| Number of flueless ga    | s fires         |                    |               |               |               |                | Ē        | 0                            | <br>x 40 =     |        | 0                 | <br>(7c)  |
| Ū.                       |                 |                    |               |               |               |                |          |                              | -              | Air c  | hanges pe<br>hour | r         |
| Infiltration due to chir | nneys, flues,   | fans, PSVs         |               | (6a)          | ) + (6b) + (7 | 'a) + (7b) + ( | (7c) = 🗌 | 0                            | ÷ (5) =        |        | 0.00              | (8)       |
| If a pressurisation tes  | t has been ca   | nrried out or is i | ntended, pi   | roceed to (   | (17), otherw  | vise continu   | ie from  | (9) to (16)                  | _              |        |                   |           |
| Air permeability value   | , q50, expres   | ssed in cubic m    | etres per h   | our per sq    | uare metre    | of envelop     | e area   |                              |                |        | 3.00              | (17)      |
| If based on air permea   | ability value,  | then (18) = [(1    | 7) ÷ 20] + (8 | 3), otherwi   | se (18) = (1  | .6)            |          |                              |                |        | 0.15              | (18)      |
| Number of sides on w     | hich the dwe    | elling is sheltere | ed            |               |               |                |          |                              |                |        | 2                 | (19)      |
| Shelter factor           |                 |                    |               |               |               |                |          | 1 -                          | - [0.075 x (19 | 9)] =  | 0.85              | (20)      |
| Infiltration rate incorp | orating shelf   | ter factor         |               |               |               |                |          |                              | (18) x (2      | 0) =   | 0.13              | (21)      |
| Infiltration rate modif  | ied for mont    | hly wind speed     | :             |               |               |                |          |                              |                |        |                   |           |
| j                        | an Feb          | o Mar              | Apr           | Мау           | Jun           | Jul            | Au       | g Sep                        | Oct            | Nov    | Dec               |           |
| Monthly average wind     | d speed from    | Table U2           |               |               |               |                |          |                              |                |        |                   |           |
| 5.                       | 10 5.0          | 0 4.90             | 4.40          | 4.30          | 3.80          | 3.80           | 3.7      | 0 4.00                       | 4.30           | 4.50   | 4.70              | (22)      |
| Wind factor (22)m ÷ 4    |                 |                    |               |               |               |                |          |                              |                |        |                   |           |
| 1.                       | 28 1.2          | 5 1.23             | 1.10          | 1.08          | 0.95          | 0.95           | 0.9      | 3 1.00                       | 1.08           | 1.13   | 1.18              | (22a)     |
| Adjusted infiltration r  | ate (allowing   | for shelter and    | d wind facto  | or) (21) x (2 | 22a)m         |                |          |                              |                |        |                   | _         |
| 0.                       | 16 0.1          | 6 0.16             | 0.14          | 0.14          | 0.12          | 0.12           | 0.1      | 2 0.13                       | 0.14           | 0.14   | 0.15              | (22b)     |
| Calculate effective air  | change rate     | for the applica    | ble case:     |               |               |                |          |                              |                |        |                   | _         |
| If mechanical vent       | ilation: air ch | ange rate thro     | ugh system    |               |               |                |          |                              |                |        | 0.50              | (23a)     |
| If balanced with he      | eat recovery:   | efficiency in %    | allowing fo   | or in-use fa  | ictor from T  | Fable 4h       |          |                              |                |        | 79.90             | (23c)     |
| a) If balanced mec       | hanical venti   | lation with hea    | t recovery    | (MVHR) (2     | 2b)m + (23    | b) x [1 - (23  | c) ÷ 100 | ]                            | ·              |        |                   | _         |
| 0.                       | 26 0.2          | 6 0.26             | 0.24          | 0.24          | 0.22          | 0.22           | 0.2      | 2 0.23                       | 0.24           | 0.24   | 0.25              | (24a)     |
| Effective air change ra  | te - enter (2   | 4a) or (24b) or    | (24c) or (24  | ld) in (25)   | -1            |                | 1        |                              | · · · ·        |        |                   | -         |
| 0.                       | 26 0.2          | 6 0.26             | 0.24          | 0.24          | 0.22          | 0.22           | 0.2      | 2 0.23                       | 0.24           | 0.24   | 0.25              | (25)      |



| 3. Heat losses       | and heat lo         | ss paramet              | ter              |                   |                            |              |            |                  |              |                  |                  |              |             |
|----------------------|---------------------|-------------------------|------------------|-------------------|----------------------------|--------------|------------|------------------|--------------|------------------|------------------|--------------|-------------|
| Element              |                     |                         | а                | Gross<br>rea, m²  | Openings<br>m <sup>2</sup> | Net<br>A,    | area<br>m² | U-value<br>W/m²K | A x U V      | V/К к-<br>kJ     | value,<br>l/m².K | Ахк,<br>kJ/K |             |
| Window               |                     |                         |                  |                   |                            | 31           | 68 x       | 1.33             | = 42.0       | 0                |                  |              | (27)        |
| Door                 |                     |                         |                  |                   |                            | 2.           | .14 x      | 1.10             | = 2.35       | 5                |                  |              | (26)        |
| External wall        |                     |                         |                  |                   |                            | 81           | 67 x       | 0.20             | = 16.3       | 3                |                  |              | (29a        |
| Roof                 |                     |                         |                  |                   |                            | 100          | 0.90 x     | 0.15             | = 15.1       | 4                |                  |              | (30)        |
| Total area of ext    | ternal elem         | ents ∑A, m <sup>2</sup> | 2                |                   |                            | 21           | 5.39       |                  |              |                  |                  |              | (31)        |
| Fabric heat loss,    | W/K = ∑(A           | × U)                    |                  |                   |                            |              |            |                  | (2           | 26)(30) + (      | (32) =           | 75.82        | (33)        |
| Heat capacity C      | m = ∑(А x к)        |                         |                  |                   |                            |              |            | (28)             | .(30) + (32) | + (32a)(3        | 2e) =            | N/A          | (34)        |
| Thermal mass p       | arameter (T         | MP) in kJ/r             | m²K              |                   |                            |              |            |                  |              |                  |                  | 250.00       | (35)        |
| Thermal bridges      | ;<br>;: Σ(L x Ψ) ca | alculated u             | sing Appen       | dix K             |                            |              |            |                  |              |                  |                  | 16.94        | ] (36)      |
| Total fabric heat    | t loss              |                         | 0 11-            |                   |                            |              |            |                  |              | (33) + (         | 36) =            | 92.76        | (37)        |
|                      | Jan                 | Feb                     | Mar              | Apr               | May                        | Jun          | Jul        | Aug              | Sep          | Oct              | Nov              | Dec          |             |
| Ventilation heat     | loss calcula        | ated month              | nlv 0.33 x (2    | 25)m x (5)        |                            |              |            |                  |              |                  |                  |              |             |
|                      | 22 77               | 22 50                   | 22.22            | 20.84             | 20.57                      | 19 19        | 19 19      | 18 91            | 19 74        | 20.57            | 21 12            | 21.67        | (38)        |
| Heat transfer co     | efficient. W        | /K (37)m -              | + (38)m          | 20.01             | 20.37                      | 15.15        | 15.15      | 10.51            | 15.71        | 20.57            |                  | 21.07        | _ (30)      |
|                      | 115 53              | 115.26                  | 114 98           | 113 60            | 113 33                     | 111 95       | 111 95     | 111 67           | 112 50       | 113 33           | 113.88           | 114 43       | 7           |
|                      | 115.55              | 115.20                  | 114.50           | 115.00            | 115.55                     | 111.55       | 111.55     | 111.07           | Average =    | <u>Γ(39)1 12</u> | /12 =            | 113 53       | _<br>] (30) |
| Heat loss naram      | eter (HIP)          | W/m <sup>2</sup> K (30  | 9)m ÷ (4)        |                   |                            |              |            |                  | Average -    | 2(33)112         | /12              | 115.55       |             |
|                      | 1 15                | 1 1 1                   | 1 1 1 1          | 1 1 2             | 1 1 2                      | 1 11         | 1 1 1      | 1 1 1            | 1 1 1        | 1 1 2            | 1 1 2            | 1 1 2        | ٦           |
|                      | 1.15                | 1.14                    | 1.14             | 1.15              | 1.12                       | 1.11         | 1 1.11     | 1.11             | 1.11         | <u> </u>         | /12 -            | 1 12         |             |
| Number of days       | in month (          | Table 1a)               |                  |                   |                            |              |            |                  | Average -    | 2(40)112         | /12              | 1.15         | _ (40)      |
| Number of days       |                     |                         | 21.00            | 20.00             | 21.00                      | 20.00        | 21.00      | 21.00            | 20.00        | 21.00            | 20.00            | 21.00        |             |
|                      | 51.00               | 28.00                   | 51.00            | 50.00             | 51.00                      | 30.00        | 51.00      | 51.00            | 50.00        | 51.00            | 50.00            | 51.00        | _ (40)      |
| 4. Water heati       | ng energy r         | equiremen               | ıt               |                   |                            |              |            |                  |              |                  |                  |              |             |
| Assumed occup        | ancy, N             |                         |                  |                   |                            |              |            |                  |              |                  |                  | 2.75         | (42)        |
| Annual average       | hot water u         | isage in litr           | es per day       | Vd,average        | = (25 x N) +               | 36           |            |                  |              |                  |                  | 99.46        | (43)        |
|                      | Jan                 | Feb                     | Mar              | Apr               | May                        | Jun          | Jul        | Aug              | Sep          | Oct              | Nov              | Dec          |             |
| Hot water usage      | e in litres pe      | r day for ea            | ach month        | Vd,m = fact       | tor from Tab               | le 1c x (43  | 3)         |                  |              |                  |                  |              |             |
|                      | 109.40              | 105.43                  | 101.45           | 97.47             | 93.49                      | 89.51        | 89.51      | 93.49            | 97.47        | 101.45           | 105.43           | 109.40       | 7           |
|                      |                     |                         |                  |                   |                            |              |            | •                | •            | <u>Σ</u> (44)1.  | 12 =             | 1193.50      | (44)        |
| Energy content       | of hot wate         | r used = 4.:            | 18 x Vd,m x      | nm x Tm/3         | 3600 kWh/m                 | onth (see    | Tables 1b, | , 1c 1d)         |              |                  |                  |              |             |
|                      | 162.24              | 141.90                  | 146.43           | 127.66            | 122.49                     | 105.70       | 97.95      | 112.40           | 113.74       | 132.55           | 144.69           | 157.12       | ٦           |
|                      |                     |                         |                  |                   |                            |              | 1          | 1                |              | Σ(45)1.          | 12 =             | 1564.86      | <br>(45)    |
| Distribution loss    | 6 0.15 x (45        | )m                      |                  |                   |                            |              |            |                  |              | 2( -)            | L                |              |             |
|                      | 24.34               | 21.28                   | 21.96            | 19.15             | 18.37                      | 15.86        | 14.69      | 16.86            | 17.06        | 19.88            | 21.70            | 23.57        | (46)        |
| Storage volume       | (litres) inclu      | uding any s             | olar or WW       | HRS storag        | re within san              | ne vessel    | 1.00       | 10.00            | 1,100        | 10.00            |                  | 150.00       | (47)        |
| Water storage l      |                     |                         | 0.0.0            |                   | ,                          |              |            |                  |              |                  | L                | 100100       |             |
| a) If manufactur     | er's declare        | d loss facto            | or is known      | (kWh/day)         |                            |              |            |                  |              |                  |                  | 1 31         | (48)        |
| Temperature          | er succiare         | n Tahle 2h              |                  | (kwn/udy)         |                            |              |            |                  |              |                  |                  | 0.54         |             |
| Enormy loct f        | rom water of        | torago (k)              | $(h/d_{2}y)$ (4) | (40)              |                            |              |            |                  |              |                  |                  | 0.54         |             |
| Entor (50) or (5/    | 1) in (55)          | torage (KW              | (40              | 5) ^ (45)         |                            |              |            |                  |              |                  |                  | 0.71         |             |
| Water storage        | +, 111 (33)         | ad for each             | month (F         | $5) \times (41)m$ |                            |              |            |                  |              |                  | L                | 0.71         | _ (55)      |
| vvalei siorage li    |                     |                         |                  | ) A (41)III       | 21.02                      | 24 22        | 21.02      | 21.02            | 24.22        | 24.02            | 24.22            | 24.02        |             |
| If the vessel as     |                     | 13.97                   | 21.93            |                   |                            | 21.22        | 1 21.93    | 21.93            | 21.22        | 21.93            | 21.22            | 21.93        | _ (56)      |
| n the vessel con     |                     | ateu solar s            |                  |                   | v vv пк5 (56)ľ             | 11 X [(47) - | vsj÷(47),  | eise (56)        | 24.22        | 24.00            | 24.22            | 24.00        |             |
| Duline a start start | 21.93               | 19.81                   | 21.93            | 21.22             | 21.93                      | 21.22        | 21.93      | 21.93            | 21.22        | 21.93            | 21.22            | 21.93        | _ (57)      |
| urumony circuit l    | oss for each        | month fro               | m Table 3        |                   |                            |              |            |                  |              |                  |                  |              |             |

|  | -  |  |  |   |  |  |  |   |  |  |  | -   | ,  |
|--|--|--|--|---|--|--|--|---|--|--|--|---|--|
|  | 23.26  | 21.01  | 23.26  | 22.51   | 23.26  | 22.51  | 23.26  | 23.26   | 22.51  | 23.26  | 22.51  | 23.26   | (59)   |
| Combi loss for e   | ach month  | from Table   | 3a, 3b or 3  | с   |  |  |  |   |  |  |  |   |  |
|  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00   | 0.00   | 0.00  | (61)   |
| Total heat requi   | red for wate   | er heating o   | calculated f   | or each mo  | onth 0.85 x  | (45)m + (40  | 6)m + (57)n  | n + (59)m +   | · (61)m  |  |  |   | -  |
|  | 207 43   | 182 72   | 191 62   | 171 39  | 167 68   | 149 43   | 143 14   | 157 59  | 157 47   | 177 74   | 188 42   | 202 32  | (62)   |
| Solar DHW innu   | t calculated   |  | andix G or /   | Annendix H  | 107.00   | 115.15   | 113.11   | 107.00  | 157.17   | 1,,,,,   | 100.12   | 202.52  | ] (02)   |
|  |  |  |  |   |  |  |  |   |  |  |  |   | 1 ( )  |
|  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00   | 0.00   | 0.00  | (63)   |
| Output from wa   | ter heater f   | or each mo   | onth (kWh/   | month) (62  | 2)m + (63)m  | 1  |  |   |  |  |  |   |  |
|  | 207.43   | 182.72   | 191.62   | 171.39  | 167.68   | 149.43   | 143.14   | 157.59  | 157.47   | 177.74   | 188.42   | 202.32  |  |
|  |  |  |  |   |  |  |  |   |  | ∑(64)1   | 12 = 2   | 2096.96   | (64)   |
| Heat gains from  | water heat   | ing (kWh/n   | nonth) 0.2   | 5 × [0.85 × (   | (45)m + (61  | )m] + 0.8 ×  | [(46)m + (5  | 57)m + (59)   | m]   |  |  |   |  |
|  | 90.10  | 79.84  | 84.84  | 77.43   | 76.88  | 70.13  | 68.72  | 73.52   | 72.81  | 80.23  | 83.10  | 88.40   | (65)   |
|  |  |  |  |   |  |  |  |   |  |  |  |   | ] ()   |
| 5. Internal gair   | 15   |  |  |   |  |  |  |   |  |  |  |   |  |
|  | Jan  | Feb  | Mar  | Apr   | May  | Jun  | Jul  | Aug   | Sep  | Oct  | Nov  | Dec   |  |
| Metabolic gains  | (Table 5)  |  |  |   |  |  |  |   |  |  |  |   |  |
| 0  | 137 39   | 137 39   | 137 39   | 137 39  | 137 39   | 137 39   | 137 39   | 137 39  | 137 39   | 137 39   | 137 39   | 137 39  | (66)   |
| Lighting gains (c  |  | Appondix   |  | 10 or 100)  |  |  | 137.35   | 137.35  | 137.35   | 137.33   | 157.55   | 157.55  | ] (00)   |
| Lighting gains (C  |  | Аррепиіх   | L, equation  | L9 Of L9a),   |  |  |  |   |  |  |  | 1   | 1  |
|  | 22.98  | 20.41  | 16.60  | 12.57   | 9.39   | 7.93   | 8.57   | 11.14   | 14.95  | 18.98  | 22.16  | 23.62   | (67)   |
| Appliance gains  | (calculated  | in Appendi   | x L, equatio   | on L13 or L1  | L3a), also se  | ee Table 5   |  |   |  |  |  |   |  |
|  | 257.77   | 260.45   | 253.71   | 239.36  | 221.24   | 204.22   | 192.85   | 190.17  | 196.91   | 211.26   | 229.38   | 246.40  | (68)   |
| Cooking gains (c   | alculated in   | Appendix   | L, equation  | L15 or L15  | a), also see   | Table 5  |  |   |  |  |  |   |  |
|  | 36.74  | 36.74  | 36.74  | 36.74   | 36.74  | 36.74  | 36.74  | 36.74   | 36.74  | 36.74  | 36.74  | 36.74   | (69)   |
| Pump and fan g   | ains (Table '  | 5a)  |  |   |  |  |  |   |  |  |  |   | ] ()   |
|  |  | 2.00   | 2.00   | 2.00  | 2.00   | 2.00   | 2.00   | 2.00  | 2.00   | 2.00   | 2.00   | 2.00  |  |
|  | 3.00   | 3.00   | 3.00   | 3.00  | 3.00   | 3.00   | 3.00   | 3.00  | 3.00   | 3.00   | 3.00   | 3.00  | [(70)  |
|  | oration (Tal   |  |  |   |  |  |  |   |  |  |  |   |  |
| LUSSES E.g. Evap   |  |  |  |   |  |  |  |   |  |  |  |   | 1  |
| Losses e.g. evap   | -109.91  | -109.91  | -109.91  | -109.91   | -109.91  | -109.91  | -109.91  | -109.91   | -109.91  | -109.91  | -109.91  | -109.91   | (71)   |
| Water heating g  | -109.91<br>;ains (Table  | -109.91<br>5)  | -109.91  | -109.91   | -109.91  | -109.91  | -109.91  | -109.91   | -109.91  | -109.91  | -109.91  | -109.91   | (71)   |
| Water heating g  | -109.91<br>ains (Table   | -109.91<br>5)<br>118.80  | -109.91<br>114.03  | -109.91<br>107.55   | -109.91<br>103.34  | -109.91<br>97.41   | -109.91<br>92.37   | -109.91<br>98.82  | -109.91<br>101.12  | -109.91<br>107.83  | -109.91<br>115.41  | -109.91   | (71)   |
| Water heating g<br>Total internal ga   | -109.91<br>;ains (Table<br>121.10<br>ains (66)m +  | -109.91<br>5)<br>118.80<br>+ (67)m + (6  | -109.91<br>114.03<br>58)m + (69)   | -109.91<br>107.55<br>m + (70)m -  | -109.91<br>103.34<br>+ (71)m + (7  | -109.91<br>97.41<br>72)m   | -109.91<br>92.37   | -109.91<br>98.82  | -109.91<br>101.12  | -109.91<br>107.83  | -109.91<br>115.41  | -109.91   | (71)<br>(72)   |
| Water heating g<br>Total internal ga   | -109.91<br>;ains (Table<br>121.10<br>ains (66)m +  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56   | -109.91<br>107.55<br>m + (70)m -<br>426.69  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19  | -109.91<br>97.41<br>72)m<br>376.77   | -109.91<br>92.37<br>361.00   | -109.91<br>98.82<br>367.35  | -109.91<br>101.12<br>380.20  | -109.91<br>107.83  | -109.91<br>115.41<br>434.16  | -109.91<br>118.81<br>456.05   | (71)<br>(72)   |
| Water heating g<br>Total internal ga   | -109.91<br>;ains (Table<br>121.10<br>ains (66)m +<br>469.07  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56   | -109.91<br>107.55<br>m + (70)m -<br>426.69  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19  | -109.91<br>97.41<br>72)m<br>376.77   | -109.91<br>92.37<br>361.00   | -109.91<br>98.82<br>367.35  | -109.91<br>101.12<br>380.20  | -109.91<br>107.83<br>405.29  | -109.91<br>115.41<br>434.16  | -109.91<br>118.81<br>456.05   | (71)<br>(72)<br>(73)   |
| Water heating g<br>Total internal ga<br>6. Solar gains   | -109.91<br>[-109.91<br>gains (Table<br>[121.10<br>ains (66)m +<br>[469.07  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56   | -109.91<br>107.55<br>m + (70)m -<br>426.69  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19  | -109.91<br>97.41<br>72)m<br>376.77   | -109.91<br>92.37<br>361.00   | -109.91<br>98.82<br>367.35  | -109.91<br>101.12<br>380.20  | -109.91<br>107.83<br>405.29  | -109.91<br>115.41<br>434.16  | -109.91<br>118.81<br>456.05   | (71)<br>(72)<br>(73)   |
| Water heating g<br>Total internal ga<br>6. Solar gains   | -109.91<br>;ains (Table<br>121.10<br>ains (66)m +<br>469.07  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56   | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area  | -109.91<br>97.41<br>72)m<br>376.77<br>Sola   | -109.91<br>92.37<br>361.00   | -109.91<br>98.82<br>367.35  | -109.91<br>101.12<br>380.20<br>g   | -109.91<br>107.83<br>405.29<br>FF  | -109.91<br>115.41<br>434.16  | -109.91<br>118.81<br>456.05<br>Gains  | (71)<br>(72)<br>(73)   |
| Water heating g<br>Total internal ga<br>6. Solar gains   | -109.91<br>ains (Table<br>121.10<br>ains (66)m +<br>469.07   | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup>  | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W  | -109.91<br>92.37<br>361.00<br>ar flux<br>1/m <sup>2</sup>  | -109.91<br>98.82<br>367.35<br>speci   | -109.91<br>101.12<br>380.20<br>g<br>ific data  | -109.91<br>107.83<br>405.29<br>FF<br>specific d  | -109.91<br>115.41<br>434.16  | -109.91<br>118.81<br>456.05<br>Gains<br>W   | (71)<br>(72)<br>(73)   |
| Water heating g<br>Total internal ga<br>6. Solar gains   | -109.91<br>-109.91<br>gains (Table<br>121.10<br>ains (66)m +<br>469.07   | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup>  | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W  | -109.91<br>92.37<br>361.00<br>ar flux<br>1/m <sup>2</sup>  | -109.91<br>98.82<br>367.35<br>speci<br>or Ta  | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b   | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table  | -109.91<br>115.41<br>434.16<br>data<br>6c  | -109.91<br>118.81<br>456.05<br>Gains<br>W   | (71)<br>(72)<br>(73)   |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest  | -109.91<br>;ains (Table<br>121.10<br>ains (66)m +<br>469.07  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44   | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W  | -109.91<br>92.37<br>361.00<br>ar flux<br>//m <sup>2</sup>  | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x   | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x                                       | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table  | -109.91<br>115.41<br>434.16<br>lata<br>6c  | -109.91<br>118.81<br>456.05<br>Gains<br>W<br>83.05  | ) (71)<br>) (72)<br>) (73)   |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast   | -109.91<br>(ains (Table<br>121.10<br>ains (66)m +<br>469.07  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24  | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W<br>3 x 1<br>x 3                                  | -109.91<br>92.37<br>361.00<br>ar flux<br>1.28 x<br>5.79 x  | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x (0<br>0.9 x (0                                | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x                             | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80                            | -109.91<br>115.41<br>434.16<br>lata<br>6c<br>= _ = _   | -109.91<br>118.81<br>456.05<br>Gains<br>W<br>83.05<br>194.45  | ] (71)<br>] (72)<br>] (73)<br>] (81)<br>] (77)   |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa  | -109.91<br>cains (Table<br>121.10<br>ains (66)m -<br>469.07<br>469.07  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7   | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24  | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W<br>2 x 1<br>x 3                                  | -109.91<br>92.37<br>361.00<br>ar flux<br>1/m <sup>2</sup><br>1.28 x<br>5.79 x                                      | -109.91<br>98.82<br>367.35<br>speci<br>or Ta<br>0.9 x (0<br>0.9 x (0                                | -109.91<br>101.12<br>380.20<br>g<br>fific data<br>able 6b<br>0.72 x<br>x                                 | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80                            | -109.91<br>115.41<br>434.16<br>data<br>6c<br>=   | -109.91<br>118.81<br>456.05<br>Gains<br>W<br>83.05<br>194.45  | ] (71)<br>] (72)<br>] (73)<br>] (81)<br>] (77)   |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa  | (-109.91)<br>(ains (Table<br>(121.10))<br>(ains (66)m +<br>(469.07)<br>(469.07)<br>(469.07)<br>(469.07)<br>(277.50)  | -109.91<br>5)<br>118.80<br>(67)m + (6<br>466.88<br>(82)m   | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table<br>0.7<br>0.7<br>757.78  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7   | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34   | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W<br>3 x 1<br>x 3<br>x 3                           | -109.91<br>92.37<br>361.00<br>ar flux<br>1.28 x<br>5.79 x  | -109.91<br>98.82<br>367.35<br>speci<br>or Ta<br>0.9 x (0<br>0.9 x (0<br>0.9 x (0)                   | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>0.72 x                   | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80                            | -109.91<br>115.41<br>434.16<br>lata<br>6c<br>= [<br>] = [<br>337.41                                | -109.91<br>118.81<br>456.05<br>Gains<br>W<br>83.05<br>194.45  | ] (71)<br>] (72)<br>] (73)<br>] (81)<br>] (77)<br>] (83)   |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>Solar gains in wa<br>Total gains - inter  | -109.91         gains (Table         121.10         ains (66)m +         469.07         469.07         277.50  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88<br>(82)m<br>500.28<br>lar (73)m +  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access 1<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m   | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>Factor<br>• 6d<br>7 x [<br>7 x ]<br>1061.74   | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34   | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W<br>3 x 1<br>x 3<br>1341.24                       | -109.91<br>92.37<br>361.00<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>5.79 x<br>1272.57                           | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x (0<br>0.9 x (0<br>1086.28                     | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>861.85                   | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>572.67                  | -109.91<br>115.41<br>434.16<br>lata<br>6c<br>= [<br>337.41   | -109.91<br>118.81<br>456.05<br><b>Gains</b><br>W<br>83.05<br>194.45<br>234.24   | (71)<br>(72)<br>(73)<br>(81)<br>(77)<br>(83)   |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - inte  | (-109.91)<br>(ains (Table<br>121.10)<br>(ains (66)m +<br>469.07<br>(469.07)<br>(469.07)<br>(277.50)<br>(277.50)<br>(277.50)<br>(276.58)  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88<br>466.88<br>(82)m<br>500.28<br>lar (73)m +  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m   | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7 x [<br>7 x [<br>1061.74   | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34   | -109.91<br>97.41<br>72)m<br>376.77<br>Sol:<br>W<br>X 1<br>X 3<br>1341.24                         | -109.91<br>92.37<br>361.00<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>5.79 x<br>1272.57                           | -109.91<br>98.82<br>367.35<br>speci<br>or T;<br>0.9 x ()<br>0.9 x ()<br>1086.28                     | -109.91<br>101.12<br>380.20<br>s<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>861.85                   | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>572.67                  | -109.91<br>115.41<br>434.16<br>434.16<br>6c<br>= [<br>337.41                                       | -109.91<br>118.81<br>456.05<br>Gains<br>W<br>83.05<br>194.45<br>234.24  | <ul> <li>(71)</li> <li>(72)</li> <li>(73)</li> <li>(81)</li> <li>(77)</li> <li>(83)</li> <li>(84)</li> </ul>                             |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>Solar gains in wa<br>Total gains - inte   | (-109.91)<br>(ains (Table<br>121.10)<br>(ains (66)m +<br>469.07)<br>(469.07)<br>(469.07)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(274.58)   | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88<br>466.88<br>(82)m<br>500.28<br>lar (73)m +<br>967.16  | -109.91<br>114.03<br>i8)m + (69)<br>451.56<br>Access 1<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m<br>1209.33  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7 x [<br>7 x ]<br>1061.74<br>1488.43  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34<br>1702.53                                | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>X 1<br>X 3<br>1341.24<br>1718.01                   | -109.91<br>92.37<br>361.00<br>ar flux<br>1.28 x<br>5.79 x<br>1272.57<br>1633.57                                    | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x (0<br>0.9 x (0<br>1086.28<br>1453.63          | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>861.85<br>1242.05        | -109.91<br>107.83<br>405.29<br><b>FF</b><br>specific d<br>or Table<br>0.80<br>0.80<br>572.67<br>977.96 | -109.91<br>115.41<br>434.16<br><b>lata</b><br>6c<br>= [<br>337.41<br>771.57                        | -109.91<br>118.81<br>456.05<br><b>Gains</b><br>W<br>83.05<br>194.45<br>234.24<br>690.28   | ] (71)<br>] (72)<br>] (73)<br>] (73)<br>] (81)<br>] (77)<br>] (83)<br>] (84)   |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern                           | -109.91         gains (Table         121.10         ains (66)m +         469.07         469.07         277.50         ernal and so         746.58  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88<br>466.88<br>(82)m<br>500.28<br>lar (73)m +<br>967.16<br>ture (heati   | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m<br>1209.33<br>ng season)  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7 x [<br>7 x [<br>1061.74<br>1488.43  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34<br>1702.53                                | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W<br>1341.24<br>1718.01                            | -109.91<br>92.37<br>361.00<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>5.79 x<br>1272.57<br>1633.57                | -109.91<br>98.82<br>367.35<br>speci<br>or Ta<br>0.9 x (0<br>0.9 x (0<br>1086.28<br>1453.63          | -109.91<br>101.12<br>380.20<br>g<br>fic data<br>able 6b<br>0.72 x<br>0.72 x<br>861.85<br>1242.05         | -109.91<br>107.83<br>405.29<br><b>FF</b><br>specific d<br>or Table<br>0.80<br>0.80<br>572.67<br>977.96 | -109.91<br>115.41<br>434.16<br>ata<br>6c<br>= [<br>337.41<br>771.57                                | -109.91<br>118.81<br>456.05<br><b>Gains</b><br><b>W</b><br>83.05<br>194.45<br>234.24<br>690.28  | <ul> <li>(71)</li> <li>(72)</li> <li>(73)</li> <li>(81)</li> <li>(77)</li> <li>(83)</li> <li>(84)</li> </ul>                             |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern  | (-109.91)<br>(ains (Table<br>(121.10))<br>(ains (66)m +<br>(469.07)<br>(469.07)<br>(469.07)<br>(469.07)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50)<br>(277.50 | -109.91<br>5)<br>118.80<br>-(67)m + (6<br>466.88<br>-(67)m + (6<br>466.88<br>-(67)m + (6<br>-(67)m + (6<br>-(67)m + (6<br>-(67)m + (6<br>-(67)m + (6<br>-(67)m + (6<br>-(73)m + (6)(7)m + (6)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)(7)   | -109.91<br>114.03<br>i8)m + (69)<br>451.56<br>Access f<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m<br>1209.33<br>ng season)<br>the living                                    | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7 x [<br>7 x [<br>1061.74<br>1488.43<br>area from T                               | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34<br>1702.53<br>Total P Th 1                | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>X<br>1<br>X<br>1341.24<br>1718.01                  | -109.91<br>92.37<br>361.00<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>5.79 x<br>1272.57<br>1633.57                | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x (0<br>0.9 x (0<br>1086.28<br>1453.63          | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>861.85<br>1242.05        | -109.91<br>107.83<br>405.29<br><b>FF</b><br>specific d<br>or Table<br>0.80<br>0.80<br>572.67<br>977.96 | -109.91<br>115.41<br>434.16<br><b>lata</b><br><b>6c</b><br>= [<br>337.41<br>771.57                 | -109.91<br>118.81<br>456.05<br>Gains<br>W<br>83.05<br>194.45<br>234.24<br>690.28  | <ul> <li>(71)</li> <li>(72)</li> <li>(73)</li> <li>(81)</li> <li>(77)</li> <li>(83)</li> <li>(84)</li> </ul>                             |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern<br>Temperature du                      | (-109.91)<br>(ains (Table<br>121.10<br>ains (66)m +<br>469.07<br>469.07<br>277.50<br>ernal and so<br>746.58<br>hal tempera<br>uring heating  | -109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88<br>466.88<br>(82)m<br>500.28<br>lar (73)m +<br>967.16<br>ture (heati<br>g periods in<br>Eab  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m<br>1209.33<br>ng season)<br>the living a                                  | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7 x 7<br>1061.74<br>1488.43<br>area from T  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34<br>1702.53<br>Table 9, Th1<br>May         | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W<br>1341.24<br>1718.01                            | -109.91<br>92.37<br>361.00<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>5.79 x<br>1272.57<br>1633.57                | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x (0<br>0.9 x (0<br>1086.28<br>1453.63          | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>861.85<br>1242.05        | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>572.67<br>977.96        | -109.91<br>115.41<br>434.16<br>ata<br>6c<br>= [<br>337.41<br>771.57                                | <ul> <li>-109.91</li> <li>118.81</li> <li>456.05</li> <li>Gains<br/>W</li> <li>83.05</li> <li>194.45</li> <li>234.24</li> <li>690.28</li> <li>21.00</li> <li>Dec</li> </ul>                 | <ul> <li>(71)</li> <li>(72)</li> <li>(73)</li> <li>(81)</li> <li>(77)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> </ul>               |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern<br>Temperature du                      | atts $\Sigma(74)$ m<br>277.50<br>anal and so<br>746.58<br>atts pan<br>comparison   | -109.91<br>-109.91<br>5)<br>118.80<br>+ (67)m + (6<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>466.88<br>46 | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m<br>1209.33<br>ng season)<br>the living a<br>Mar                           | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7 x [<br>7 x [<br>1061.74<br>1488.43<br>area from T<br>Apr                        | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34<br>1702.53<br>Table 9, Th1<br>May         | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>X<br>1<br>x 1<br>1341.24<br>1718.01<br>(°C)<br>Jun | -109.91<br>92.37<br>361.00<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>5.79 x<br>1272.57<br>1633.57<br>Jul         | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x (0<br>0.9 x (0<br>1086.28<br>1453.63          | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>861.85<br>1242.05<br>Sep | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>572.67<br>977.96        | -109.91<br>115.41<br>434.16<br>434.16<br>ata<br>6c<br>= [<br>] = [<br>]<br>337.41<br>771.57<br>Nov | <ul> <li>-109.91</li> <li>118.81</li> <li>456.05</li> <li>Gains<br/>W</li> <li>83.05</li> <li>194.45</li> <li>234.24</li> <li>690.28</li> <li>690.28</li> <li>21.00</li> <li>Dec</li> </ul> | <ul> <li>(71)</li> <li>(72)</li> <li>(73)</li> <li>(81)</li> <li>(77)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> </ul>               |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>Solar gains in wa<br>Total gains - intern<br>Temperature du<br>Utilisation facto                  | atts $\Sigma(74)$ m<br>277.50<br>746.58<br>276<br>746.58<br>121.10<br>277.50<br>746.58<br>746.58<br>121.10<br>746.58<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>121.10<br>12   | -109.91<br>5)<br>118.80<br>- (67)m + (6<br>466.88<br>466.88<br>(82)m<br>500.28<br>(82)m<br>500.28<br>(82)m +<br>967.16<br>ture (heati<br>g periods in<br>Feb<br>or living are  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m<br>1209.33<br>ng season)<br>n the living a<br>Mar<br>ea n1,m (se          | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>Factor<br>6d<br>7 x 7<br>1061.74<br>1488.43<br>area from T<br>Apr<br>e Table 9a)                  | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34<br>1702.53<br>Table 9, Th1<br>May         | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>X 1<br>X 3<br>1341.24<br>1718.01<br>(°C)<br>Jun    | -109.91<br>92.37<br>361.00<br>ar flux<br>1.28 x<br>5.79 x<br>1272.57<br>1633.57<br>Jul                             | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x (0)<br>0.9 x (0)<br>1086.28<br>1453.63<br>Aug | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>0.72 x<br>861.85<br>1242.05<br>Sep | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>572.67<br>977.96        | -109.91<br>115.41<br>434.16<br>ata<br>6c<br>= [<br>337.41<br>771.57<br>Nov                         | -109.91<br>118.81<br>456.05<br><b>Gains</b><br>W<br>83.05<br>194.45<br>234.24<br>690.28<br>21.00<br><b>Dec</b>  | <ul> <li>(71)</li> <li>(72)</li> <li>(73)</li> <li>(81)</li> <li>(77)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> </ul>               |
| Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern<br>Temperature du<br>Utilisation facto | (-109.91)<br>(-109.91)<br>(-109.91)<br>(-109.91)<br>(-109.91)<br>(-109.91)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)<br>(-109.9)   | -109.91<br>5)<br>118.80<br>← (67)m + (6<br>466.88<br>466.88<br>466.88<br>500.28<br>1ar (73)m +<br>967.16<br>ture (heati<br>g periods in<br>Feb<br>or living are<br>0.98  | -109.91<br>114.03<br>58)m + (69)<br>451.56<br>Access f<br>Table<br>0.7<br>0.7<br>757.78<br>(83)m<br>1209.33<br>ng season)<br>n the living a<br>Mar<br>ea n1,m (sea<br>0.94 | -109.91<br>107.55<br>m + (70)m -<br>426.69<br>factor<br>6d<br>7 x 7<br>7 x 7<br>1061.74<br>1488.43<br>area from T<br>Apr<br>e Table 9a)<br>0.80 | -109.91<br>103.34<br>+ (71)m + (7<br>401.19<br>Area<br>m <sup>2</sup><br>18.44<br>13.24<br>1301.34<br>1702.53<br>Table 9, Th1<br>May<br>0.60 | -109.91<br>97.41<br>72)m<br>376.77<br>Sola<br>W<br>1341.24<br>1718.01<br>(°C)<br>Jun<br>0.41     | -109.91<br>92.37<br>361.00<br>ar flux<br>//m <sup>2</sup><br>1.28 ×<br>5.79 ×<br>1272.57<br>1633.57<br>Jul<br>0.30 | -109.91<br>98.82<br>367.35<br>speci<br>or Ti<br>0.9 x ()<br>1086.28<br>1453.63<br>Aug<br>0.35       | -109.91<br>101.12<br>380.20<br>g<br>ific data<br>able 6b<br>0.72 x<br>861.85<br>1242.05<br>Sep<br>0.60   | -109.91<br>107.83<br>405.29<br>FF<br>specific d<br>or Table<br>0.80<br>0.80<br>572.67<br>977.96        | -109.91<br>115.41<br>434.16<br>434.16<br>ata<br>6c<br>= [<br>337.41<br>771.57<br>Nov<br>0.99       | -109.91<br>118.81<br>456.05<br>Gains<br>W<br>83.05<br>194.45<br>234.24<br>690.28<br>21.00<br>Dec<br>1.00  | <ul> <li>(71)</li> <li>(72)</li> <li>(73)</li> <li>(81)</li> <li>(77)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> </ul> |

|   | 20.12   | 20.31  | 20.57   | 20.82  | 20.92  | 20.94                                       | 20.95                          | 20.95                          | 20.93   | 20.74   | 20.37  | 20.08  | (87)   |
|---|---|--|---|--|--|---|--------------------------------|--------------------------------|---|---|--|--|--|
| Temperature du  | uring heating   | g periods in   | the rest of   | dwelling fi  | rom Table 9  | 9, Th2(°C)                                  |                                |                                |   |   | •  |  | -  |
|   | 19.96   | 19.97  | 19.97   | 19.98  | 19.98  | 19.99                                       | 19.99                          | 20.00                          | 19.99   | 19.98   | 19.98  | 19.97  | (88)   |
| Utilisation facto   | or for gains for  | or rest of d   | welling n2,   | m  |  |   |                                |                                |   |   |  |  |  |
|   | 0.99  | 0.98   | 0.92  | 0.76   | 0.54   | 0.35  | 0.23                           | 0.28                           | 0.52  | 0.87  | 0.98   | 1.00   | (89)   |
| Mean internal t   | emperature  | in the rest  | of dwelling   | g T2 (follow   | steps 3 to   | 7 in Table 9                                | e)                             |                                | L   |   |  |  |  |
|   | 18.79   | 19.08  | 19.44   | 19.77  | 19.88  | 19.91                                       | 19.92                          | 19.92                          | 19.90   | 19.69   | 19.17  | 18.75  | (90)   |
| Living area fract   | tion  |  | _   | _  |  |   |                                |                                | Li  | ving area ÷   | (4) =  | 0.33   | (91)   |
| Mean internal t   | emperature  | for the wh   | ole dwellin   | g fLA x T1 +   | -(1 - fLA) x T   | r2  |                                |                                |   | 0 * **  |  |  |  |
|   | 19.23   | 19,49  | 19.82   | 20.12  | 20.23  | 20.26                                       | 20.26                          | 20.26                          | 20.24   | 20.04   | 19.57  | 19,19  | (92)   |
| Apply adjustme  | nt to the me  | an interna   | l temperati   | ure from Ta  | ble 4e whe   | re appropr                                  | iate                           | 20.20                          | 20.21   | 20.01   | 19.37  | 15.15  | ] (32)   |
|   | 19.08   | 19 34  | 19.67   | 19.97  | 20.08  | 20.11                                       | 20.11                          | 20 11                          | 20.09   | 19.89   | 19.42  | 19.04  | (93)   |
|   | 15.00   | 15.54  | 15.07   | 15.57  | 20.00  | 20.11                                       | 20.11                          | 20.11                          | 20.05   | 15.05   | 15.42  | 13.04  | ] (55)   |
| 8. Space heating  | ng requirem   | ent  |   |  |  |   |                                |                                |   |   |  |  |  |
|   | Jan   | Feb  | Mar   | Apr  | Мау  | Jun   | Jul                            | Aug                            | Sep   | Oct   | Nov  | Dec  |  |
| Utilisation facto   | or for gains, r   | յՠ   |   |  |  |   |                                |                                |   |   |  |  |  |
|   | 0.99  | 0.97   | 0.91  | 0.76   | 0.54   | 0.36  | 0.24                           | 0.28                           | 0.53  | 0.87  | 0.98   | 0.99   | (94)   |
| Useful gains, ηn  | nGm <i>,</i> W (94  | )m x (84)m   | 1   |  |  |   |                                |                                |   |   |  |  |  |
|   | 740.06  | 940.04   | 1104.46   | 1129.30  | 927.74   | 614.44                                      | 392.56                         | 413.81                         | 660.39  | 846.63  | 754.70   | 686.05   | (95)   |
| Monthly averag  | e external te   | emperature   | e from Tabl   | e U1   |  |   |                                |                                |   |   |  |  | _  |
|   | 4.30  | 4.90   | 6.50  | 8.90   | 11.70  | 14.60                                       | 16.60                          | 16.40                          | 14.10   | 10.60   | 7.10   | 4.20   | (96)   |
| Heat loss rate fo   | or mean inte  | ernal tempe  | erature, Lm,  | , W [(39)m   | x [(93)m -   | (96)m]                                      |                                |                                |   | •   |  | •  | -  |
|   | 1707.82   | 1663.97  | 1514.06   | 1257.38  | 949.44   | 616.41                                      | 392.75                         | 414.26                         | 673.92  | 1052.32   | 1402.97  | 1698.29  | (97)   |
| Space heating re  | equirement,   | kWh/mon  | th 0.024 x  | [(97)m - (9  | 5)m] x (41)ı   | m   |                                |                                |   |   |  |  | _  |
|   | 720.01  | 486.49   | 304.74  | 92.22  | 16.15  | 0.00  | 0.00                           | 0.00                           | 0.00  | 153.04  | 466.76   | 753.11   | ]  |
|   |   |  |   |  |  |   |                                |                                |   |   |  |  |  |
|   |   |  |   |  |  |   |                                |                                | ∑(98  | 8)15, 10  | .12 = 2  | 992.50   | (98)   |
| Space heating re  | equirement  | kWh/m²/y   | ear   |  |  |   |                                |                                | ∑(98  | 8)15, 10<br>(98)  | .12 = 2<br>÷ (4)   | 2992.50  | ) (98)<br>(99)   |
| Space heating re  | equirement  | kWh/m²/y   | ear   |  |  |   |                                |                                | ∑(98  | 8)15, 10<br>(98)  | .12 = 2<br>÷ (4)   | 2992.50<br>29.66   | ] (98)<br>] (99)   |
| Space heating re<br>9a. Energy req  | equirement<br>uirements -   | kWh/m²/yı<br>individual  | ear<br>heating sys  | stems inclu  | ding micro   | -CHP  |                                |                                | ∑(98  | 8)15, 10<br>(98)  | .12 = 2<br>÷ (4)   | 2992.50<br>29.66   | ] (98)<br>] (99)   |
| Space heating re<br>9a. Energy req<br>Space heating   | equirement<br>uirements -   | kWh/m²/yo<br>individual  | ear<br>heating sys  | stems inclu  | iding micro  | -CHP  |                                |                                | ∑(98  | 8)15, 10<br>(98)  | .12 = 2<br>÷ (4)   | 2992.50<br>29.66   | ] (98)<br>] (99)   |
| Space heating re<br>9a. Energy req<br>Space heating<br>Fraction of space  | equirement<br>uirements -<br>:e heat from   | kWh/m²/yı<br>individual<br>secondary   | ear<br>heating sys<br>/supplemen  | stems inclu  | nding micro<br>m (table 11                                   | -СНР<br>)                                   |                                |                                | ∑(9ł  | 8)15, 10<br>(98)  | .12 = 2<br>÷ (4)   | 2992.50<br>29.66<br>0.00   | ] (98)<br>] (99)<br>] (201)  |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space   | equirement<br>uirements -<br>e heat from<br>e heat from   | kWh/m²/yı<br>individual<br>secondary<br>main syste   | ear<br>heating sys<br>/supplemen<br>em(s)   | stems inclu<br>ntary system                                    | iding micro<br>m (table 11                                   | -CHP<br>)                                   |                                |                                | ∑(9;  | 8)15, 10<br>(98)<br>1 - (20   | 12 = 2<br>÷ (4)<br>01) =   | 2992.50<br>29.66<br>0.00<br>1.00   | ] (98)<br>] (99)<br>] (201)<br>] (202)   |
| Space heating re<br>9a. Energy req<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space  | equirement<br>uirements -<br>ce heat from<br>ce heat from<br>ce heat from   | kWh/m²/ye<br>individual<br>secondary<br>main syste<br>main syste   | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2   | stems inclu  | iding micro<br>m (table 11                                   | -CHP<br>)                                   |                                |                                | ∑(ð:  | 8)15, 10<br>(98)<br>1 - (2(   | 12 = 2<br>÷ (4)<br>01) =   | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00   | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)  |
| Space heating req<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total  | equirement<br>uirements -<br>ce heat from<br>ce heat from<br>ce heat from<br>I space heat   | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>main syste<br>from main  | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1   | stems inclu  | iding micro<br>m (table 11                                   | -CHP<br>)                                   |                                |                                | ∑(98  | 8)15, 10<br>(98)<br>1 - (20<br>)2) x [1- (20  | 12 = 2<br>÷ (4)<br>01) =<br>3)] =  | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00   | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)   |
| Space heating re<br>9a. Energy req<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total  | equirement<br>uirements -<br>e heat from<br>e heat from<br>e heat from<br>I space heat<br>I space heat  | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>main syste<br>from main<br>from main   | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2   | stems inclu  | ding micro<br>m (table 11                                    | -CHP<br>)                                   |                                |                                | ∑(94  | 8)15, 10<br>(98)<br>1 - (2(<br>)2) x [1- (20<br>(202) x (2(   | 12 = 2<br>÷ (4)<br>01) =<br>3)] =<br>03) =   | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00   | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)  |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma  | equirement<br>uirements -<br>e heat from<br>e heat from<br>se heat from<br>I space heat<br>I space heat<br>in system 1  | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>(%)  | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2   | stems inclu  | iding micro<br>m (table 11                                   | -CHP<br>)                                   |                                |                                | ∑(98  | 8)15, 10<br>(98)<br>1 - (20<br>)2) x [1- (20<br>(202) x (20   | 12 = 2<br>÷ (4)<br>(4)<br>(1) =<br>(3)] =<br>(3)] =<br>(3) =<br>(4) =<br>(3) =  | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70  | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Space heating re<br>9a. Energy req<br>Space heating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma   | equirement<br>uirements -<br>e heat from<br>e heat from<br>l space heat<br>l space heat<br>in system 1<br>Jan   | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb                                       | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar  | stems inclu<br>ntary system                                    | iding micro<br>m (table 11<br>May                            | -CHP<br>)<br>Jun                            | Jul                            | Aug                            | ∑(94<br>(20<br><b>Sep</b>                                     | 8)15, 10<br>(98)<br>1 - (2(<br>)2) x [1- (20<br>(202) x (2(<br>Oct  | 12 = 2<br>÷ (4)<br>01) =<br>3)] =<br>03) =<br>Nov  | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br>Dec   | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma<br>Space heating for   | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>in system 1<br>Jan<br>uel (main sys  | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW                                      | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month                              | stems inclu<br>ntary system<br>Apr                             | nding micro<br>m (table 11<br>May                            | -CHP<br>)<br>Jun                            | Jul                            | Aug                            | ∑(98<br>(20<br><b>Sep</b>                                     | 8)15, 10<br>(98)<br>1 - (20<br>)2) × [1- (20<br>(202) × (20<br><b>Oct</b>   | 12 = 2<br>÷ (4)<br>(4)<br>(1) =<br>(3)] =<br>(3)] =<br>(3)] =<br>(3) = | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br>Dec   | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma<br>Space heating for   | equirement<br>uirements -<br>e heat from<br>e heat from<br>l space heat<br>l space heat<br>l space heat<br>un system 1<br>Jan<br>uel (main sys  | kWh/m²/yu<br>individual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kV<br>524.80              | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74                    | stems inclu<br>ntary system<br><b>Apr</b><br>99.48             | ding micro<br>m (table 11<br>May<br>17.42                    | -CHP<br>)<br>Jun<br>0.00                    | Jul<br>0.00                    | <b>Aug</b>                     | ∑(94<br>(20<br><b>Sep</b><br>0.00                             | 8)15, 10<br>(98)<br>1 - (20<br>)2) x [1- (20<br>(202) x (20<br>(202) x (20<br><b>Oct</b><br>165.09  | 12 = 2<br>÷ (4)<br>(4)<br>(1) =<br>(3)] =<br>(3)] =<br>(3)] =<br>Nov<br>503.51   | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br>Dec<br>812.42   | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma<br>Space heating for   | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>Jan<br>uel (main sys   | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>524.80                            | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74                    | stems inclu<br>ntary system<br><b>Apr</b><br>99.48             | nding micro<br>m (table 11<br>May<br>17.42                   | -CHP<br>)<br>Jun<br>0.00                    | Jul<br>0.00                    | <b>Aug</b>                     | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 8)15, 10<br>(98)<br>1 - (20<br>)2) × [1- (20<br>(202) × (20<br>(202) × (20<br><b>Oct</b><br>165.09<br>1)15, 10                                | 12 = 2 $(4)$ $(1) = 2$ $(4)$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(2) = 2$ $(2) = 2$ $(2) = 2$ $(3)$   | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br>Dec<br>812.42<br>3228.16  | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>]<br>] (211)   |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma<br>Space heating for<br><b>Water heating</b>   | equirement<br>uirements -<br>e heat from<br>e heat from<br>se heat from<br>I space heat<br>I space heat<br>I space heat<br>un system 1<br>Jan<br>uel (main sys<br>776.71  | kWh/m²/yu<br>individual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kV<br>524.80              | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74                    | stems inclu<br>ntary system<br>Apr<br>99.48                    | ding micro<br>m (table 11<br>May<br>17.42                    | -CHP<br>)<br>Jun<br>0.00                    | Jul<br>0.00                    | Aug<br>0.00                    | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 8)15, 10<br>(98)<br>1 - (20<br>)2) x [1- (20<br>(202) x (20<br>(202) x (20<br><b>Oct</b><br>165.09<br>1)15, 10                                | 12 = 2 $(4)$ $(1) = 2$ $(3) = 2$   | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br><b>Dec</b><br>812.42<br>8228.16                                 | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (201)  |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Efficiency of ma<br>Space heating for<br><b>Water heating</b><br>Efficiency of wa  | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>un system 1<br>Jan<br>uel (main sys<br>776.71  | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kV<br>524.80                            | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74                    | stems inclu<br>ntary system<br><b>Apr</b><br>99.48             | nding micro<br>m (table 11<br>May<br>17.42                   | -CHP<br>)<br>Jun<br>0.00                    | Jul<br>0.00                    | Aug<br>0.00                    | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 8)15, 10<br>(98)<br>1 - (20<br>)2) × [1- (20<br>(202) × (20<br>(202) × (20<br><b>Oct</b><br><u>165.09</u><br>1)15, 10                         | 12 = 2 $(4)$ $(1) = 2$ $(3) = 2$   | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br>Dec<br>812.42<br>228.16   | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)  |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma<br>Space heating fu<br><b>Water heating</b><br>Efficiency of wa  | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>U uel (main system 1<br>Jan<br>uel (main system 1<br>776.71<br>ter heater<br>87.66   | kWh/m²/yu<br>individual<br>secondary<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>524.80              | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74                    | stems inclu<br>ntary system<br><b>Apr</b><br>99.48<br>83.04    | ding micro<br>m (table 11<br>May<br>17.42                    | - <b>CHP</b> )<br>Jun<br>0.00               | <b>Jul</b><br>0.00<br>79.60    | Aug<br>0.00                    | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.60           | 8)15, 10<br>(98)<br>1 - (20<br>)2) x [1- (20<br>(202) x (20<br>(202) x (20<br><b>Oct</b><br>165.09<br>1)15, 10                                | 12 = 2 $(4)$ $(1) = 2$ $(4)$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(2) = 2$ $(2) = 2$ $(3)$   | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br><b>Dec</b><br>812.42<br>3228.16<br>87.80                        | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)<br>] (211)   |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Efficiency of ma<br>Space heating for<br><b>Water heating</b><br>Efficiency of wa<br>Water heating for   | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>U space heat<br>I space heat I space he    | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>524.80<br>87.10<br>onth           | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74                    | Apr<br>99.48<br>83.04  | May<br>17.42   | -CHP<br>)<br>Jun<br>0.00<br>79.60           | <b>Jul</b><br>0.00<br>79.60    | Aug<br>0.00<br>79.60           | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.60           | 8)15, 10<br>(98)<br>1 - (20)<br>(202) × [1- (20)<br>(202) × (20)<br>(202) × (20)<br>0ct<br>165.09<br>1)15, 10<br>84.22                        | 12 = 2 $(4)$ $(1) = 2$ $(4)$ $(1) = 2$ $(1)$   | 2992.50<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br>Dec<br>812.42<br>3228.16<br>3228.16                             | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)<br>] (211)<br>] (217)                       |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Efficiency of ma<br>Space heating for<br><b>Water heating</b><br>Efficiency of wa<br>Water heating for   | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>I space heat<br>U uel (main system 1<br>Jan<br>uel (main system 1<br>776.71<br>ter heater<br>87.66<br>fuel, kWh/m<br>236.62  | kWh/m²/yu<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>524.80<br>87.10<br>onth<br>209.77 | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74<br>85.85           | Apr<br>99.48<br>83.04  | ding micro<br>m (table 11<br>May<br>17.42<br>80.44           | -CHP<br>)<br>Jun<br>0.00<br>79.60<br>187.73 | Jul<br>0.00<br>79.60<br>179.82 | Aug<br>0.00<br>79.60           | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.60           | 8)15, 10<br>(98)<br>1 - (20<br>)2) x [1- (20<br>(202) x (20<br>(202) x (20<br>0ct<br>165.09<br>1)15, 10<br>84.22<br>211.05                    | 12 = 2 $(4)$ $(1) = 2$ $(4)$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(2) = 2$ $(2) = 2$ $(3)$   | 2992.50<br>29.66<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br><b>Dec</b><br>812.42<br>3228.16<br>87.80               | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)<br>] (211)<br>] (217)                                  |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma<br>Space heating for<br><b>Water heating</b><br>Efficiency of wa<br>Water heating for   | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>I space heat<br>Uspace heat<br>I space hea | kWh/m²/yd<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>524.80<br>87.10<br>onth<br>209.77 | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74<br>85.85           | stems inclu<br>ntary system<br>Apr<br>99.48<br>83.04<br>206.39 | ding micro<br>m (table 11<br>May<br>17.42<br>80.44<br>208.46 | -CHP<br>)<br>Jun<br>0.00<br>79.60<br>187.73 | Jul<br>0.00<br>79.60<br>179.82 | Aug<br>0.00<br>79.60<br>197.97 | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.60<br>197.83 | 8)15, 10<br>(98)<br>1 - (20<br>)2) × [1- (20<br>(202) × (20<br>(202) × (20<br>0ct<br>165.09<br>1)15, 10<br>84.22<br>211.05<br>Σ(219a)1        | 12 = 2 $(4)$ $(1) = 2$ $(4)$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(2)$   | 2992.50<br>29.66<br>29.66<br>0.00<br>1.00<br>0.00<br>92.70<br><b>Dec</b><br>812.42<br>3228.16<br>87.80<br>87.80                      | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)<br>] (211)<br>] (217)<br>] (217)<br>] (219) |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma<br>Space heating fer<br><b>Water heating</b><br>Efficiency of wa<br>Water heating for<br>Water heating for<br>Mater heating for<br>Ma | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>I space heat<br>Uspace heat<br>I space hea | kWh/m²/yu<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kV<br>524.80<br>87.10<br>onth<br>209.77 | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74<br>85.85<br>223.21 | Apr<br>99.48<br>83.04<br>206.39                                | ding micro<br>m (table 11<br>May<br>17.42<br>80.44<br>208.46 | -CHP<br>)<br>Jun<br>0.00<br>79.60<br>187.73 | Jul<br>0.00<br>79.60<br>179.82 | Aug<br>0.00<br>79.60<br>197.97 | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.60<br>197.83 | 8)15, 10<br>(98)<br>1 - (20<br>)2) × [1- (20<br>(202) × (20<br>(202) × (20<br>0ct<br>165.09<br>1)15, 10<br>84.22<br>211.05<br>Σ(219a)1        | 12 = 2 $(4)$ $(1) = 2$ $(4)$ $(1) = 2$ $(3)$   | 2992.50<br>29.66<br>29.66<br>0.00<br>1.00<br>0.00<br>0.00<br>92.70<br><b>Dec</b><br>812.42<br>3228.16<br>87.80<br>87.80              | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)<br>] (211)<br>] (217)<br>] (217)<br>] (219)            |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Efficiency of ma<br>Space heating for<br><b>Water heating</b><br>Efficiency of wa<br>Water heating for<br><b>Annual totals</b><br>Space heating for  | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>I space heat<br>Uspace heat<br>I space hea | kWh/m²/yu<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kV<br>524.80<br>87.10<br>onth<br>209.77 | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74<br>85.85<br>223.21 | stems inclu<br>ntary system<br>Apr<br>99.48<br>83.04<br>206.39 | ding micro<br>m (table 11<br>May<br>17.42<br>80.44<br>208.46 | -CHP<br>)<br>Jun<br>0.00<br>79.60<br>187.73 | Jul<br>0.00<br>79.60<br>179.82 | Aug<br>0.00<br>79.60<br>197.97 | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.60<br>197.83 | 8)15, 10<br>(98)<br>1 - (20<br>)2) × [1- (20<br>(202) × (20<br>(202) × (20<br><b>Oct</b><br>165.09<br>1)15, 10<br>84.22<br>211.05<br>Σ(219a)1 | 12 = 2 $(4)$ $(1) = 2$ $(4)$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(1) = 2$ $(2) = 2$ $(2) = 2$ $(2) = 2$ $(3) = 2$ $(3) = 2$ $(3) = 2$ $(4) = 2$ $(4) = 2$ $(4) = 2$ $(5)$   | 2992.50<br>29.66<br>29.66<br>0.00<br>1.00<br>0.00<br>92.70<br><b>Dec</b><br>812.42<br>3228.16<br>87.80<br>87.80<br>230.43<br>2506.03 | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (204)<br>] (205)<br>] (206)<br>] (206)<br>] (211)<br>] (217)<br>] (219)            |
| Space heating re<br><b>9a. Energy req</b><br><b>Space heating</b><br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of ma<br>Space heating fer<br>Water heating<br>Efficiency of wa<br>Water heating fer<br>Annual totals<br>Space heating fer  | equirement<br>uirements -<br>e heat from<br>e heat from<br>I space heat<br>I space heat<br>I space heat<br>I space heat<br>Uspace heat<br>I space hea | kWh/m²/yu<br>individual<br>secondary<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kV<br>524.80<br>87.10<br>onth<br>209.77 | ear<br>heating sys<br>/supplemen<br>em(s)<br>em 2<br>system 1<br>system 2<br>Mar<br>Vh/month<br>328.74<br>85.85           | Apr<br>99.48<br>83.04<br>206.39                                | ding micro<br>m (table 11<br>May<br>17.42<br>80.44<br>208.46 | -CHP<br>)<br>Jun<br>0.00<br>79.60<br>187.73 | Jul<br>0.00<br>79.60<br>179.82 | Aug<br>0.00<br>79.60<br>197.97 | Σ(94<br>(20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.60<br>197.83 | 8)15, 10<br>(98)<br>1 - (20<br>)2) × [1- (20<br>(202) × (20<br>(202) × (20<br>0ct<br>165.09<br>1)15, 10<br>84.22<br>211.05<br>Σ(219a)1        | 12 = 2 $(4)$ $(1) = 2$ $(4)$ $(1) = 2$ $(3)$   | 2992.50<br>29.66<br>29.66<br>0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>92.70<br>Dec<br>812.42<br>2228.16<br>87.80<br>230.43<br>2506.03 | ] (98)<br>] (99)<br>] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)<br>] (211)<br>] (211)<br>] (217)<br>] (219)            |

| Water heating fuel  |  |  | 2506.03  |
|---|--|--|--|
| Electricity for pumps, fans and electric keep-hot (Table 4f)  |  |  |  |
| mechanical ventilation fans - balanced, extract or positive inpu  | It from outside  | 172.03   | (230a)   |
| central heating pump or water pump within warm air heating  | unit   | 30.00  | (230c)   |
| boiler flue fan   |  | 45.00  | (230e)   |
| Total electricity for the above, kWh/year   |  |  | 247.03 (231)   |
| Electricity for lighting (Appendix L)   |  |  | 405.85 (232)   |
| Total delivered energy for all uses   |  | (211)(221) + (231) + (23   | 2)(237b) = 6387.06 (238)   |
| 10a. Fuel costs - individual heating systems including micro-CH   | þ  |  |  |
|   | Fuel   | Fuel price   | Fuel   |
|   | kWh/year   |  | cost £/year  |
| Space heating - main system 1   | 3228.16  | x 3.48   | x 0.01 = 112.34 (240)  |
| Water heating   | 2506.03  | x 3.48   | x 0.01 = 87.21 (247)   |
| Pumps and fans  | 247.03   | x 13.19  | x 0.01 = 32.58 (249)   |
| Electricity for lighting  | 405.85   | x 13.19  | x 0.01 = 53.53 (250)   |
| Additional standing charges   |  |  | 120.00 (251)   |
| Total energy cost   |  | (240)(242) + (2  | 45)(254) = 405.66 (255)  |
| 11a. SAP rating - individual heating systems including micro-CH   | Р  |  |  |
| Energy cost deflator (Table 12)   |  |  | 0.42 (256)   |
| Energy cost factor (ECF)  |  |  | 1.17 (257)   |
| SAP value   |  |  | 83.71  |
| SAP rating (section 13)   |  |  | 84 (258)   |
| SAP band  |  |  | В  |
|   |  |  |  |
| 12a. CO₂ emissions - individual heating systems including micro   | -CHP   |  |  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro   | -CHP<br>Energy   | Emission factor  | Emissions  |
| 12a. CO₂ emissions - individual heating systems including micro   | -CHP<br>Energy<br>kWh/year   | Emission factor<br>kg CO <sub>2</sub> /kWh   | Emissions<br>kg CO <sub>2</sub> /year  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1  | Energy<br>kWh/year<br>3228.16  | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22   | Emissions<br>kg CO <sub>2</sub> /year<br>= 697.28 (261)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating   | -CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03   | Emission factor<br>kg CO2/kWhx0.22x0.22  | Emissions<br>kg CO <sub>2</sub> /year<br>= 697.28 (261)<br>= 541.30 (264)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating  | Energy<br>kWh/year<br>3228.16<br>2506.03   | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (20  | Emissions<br>kg CO <sub>2</sub> /year<br>= 697.28 (261)<br>= 541.30 (264)<br>53) + (264) = 1238.58 (265)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans  | -CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03   | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (26<br>x 0.52  | Emissions<br>kg CO <sub>2</sub> /year<br>= 697.28 (261)<br>= 541.30 (264)<br>33) + (264) = 1238.58 (265)<br>= 128.21 (267)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting  | -CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85   | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (20<br>x 0.52<br>x 0.52  | Emissions<br>kg $CO_2/year$ =697.28(261)=541.30(264)(3) + (264) =1238.58(265)=128.21(267)=210.64(268)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year   | -CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85   | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (20<br>x 0.52<br>x 0.52<br>(2  | Emissions<br>kg $CO_2/year$ =697.28(261)=541.30(264)53) + (264) =1238.58(265)=128.21(267)=210.64(268)65)(271) =1577.43(272)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate   | -CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85   | Emission factor<br>kg CO <sub>2</sub> /kWh           x         0.22           x         0.22           (261) + (262) + (262)           x         0.52           x         0.52           x         0.52  | Emissions<br>kg CO2/year= $697.28$ (261)= $541.30$ (264) $63) + (264) =$ $1238.58$ (265)= $128.21$ (267)= $210.64$ (268) $65)(271) =$ $1577.43$ (272) $(272) \div (4) =$ $15.63$ (273)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value   | -CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85   | Emission factor<br>kg CO <sub>2</sub> /kWh           x         0.22           x         0.22           (261) + (262) + (262)           x         0.52           x         0.52           x         0.52  | Emissions<br>kg CO2/year= $697.28$ (261)= $541.30$ (264) $53) + (264) =$ $1238.58$ (265)= $128.21$ (267)= $210.64$ (268) $65)(271) =$ $1577.43$ (272) $(272) \div (4) =$ $15.63$ (273) $85.51$ $85.51$   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)   | -CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85   | Emission factor         kg CO2/kWh         x       0.22         x       0.22         (261) + (262) + (20)         x       0.52         x       0.52         x       0.52         x       0.52  | Emissions<br>kg CO2/year= $697.28$ (261)= $541.30$ (264) $63) + (264) =$ $1238.58$ (265)= $128.21$ (267)= $210.64$ (268) $65)(271) =$ $1577.43$ (272) $(272) \div (4) =$ $15.63$ (273) $85.51$ $86$ (274)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band  | Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85   | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (20<br>x 0.52<br>x 0.52<br>(2  | Emissions<br>kg $CO_2/year$ =697.28(261)=541.30(264)(3) + (264) =1238.58(265)=128.21(267)=210.64(268)(65)(271) =1577.43(272)(272) ÷ (4) =15.63(273)86(274)8  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO <sub>2</sub> , kg/year Dwelling CO <sub>2</sub> emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro   | CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85  | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (20<br>x 0.52<br>x 0.52<br>(2  | Emissions<br>kg CO2/year= $697.28$ (261)= $541.30$ (264) $53) + (264) =$ $1238.58$ (265)= $128.21$ (267)= $210.64$ (268) $65)(271) =$ $1577.43$ (272) $(272) \div (4) =$ $15.63$ (273) $85.51$ $86$ (274)B $85.51$ $86$  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band<br>13a. Primary energy - individual heating systems including micro  | CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85<br>405.85  | Emission factor         kg CO2/kWh         x       0.22         x       0.22         (261) + (262) + (20)         x       0.52         x       0.52         x       0.52         x       0.52         x       0.52         x       0.52         Y       0.52         x       0.52         x       0.52         y       0.52         y | Emissions         kg CO <sub>2</sub> /year         = $697.28$ (261)         = $541.30$ (264) $53) + (264) =$ $1238.58$ (265)         = $128.21$ (267)         = $210.64$ (268) $65)(271) =$ $1577.43$ (272)         (272) $\div$ (4) = $15.63$ (273)         86       (274)       B         Primary Energy         kWh/year  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO <sub>2</sub> , kg/year Dwelling CO <sub>2</sub> emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro Space heating - main system 1   | P-CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85<br>405.85<br>Energy<br>kWh/year<br>3228.16                             | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (20<br>x 0.52<br>x 0.52<br>x 0.52<br>(2<br>Primary factor<br>x 1.22  | Emissions<br>kg CO <sub>2</sub> /year<br>= $697.28$ (261)<br>= $541.30$ (264)<br>(264) = $1238.58$ (265)<br>= $128.21$ (267)<br>= $210.64$ (268)<br>(267) = $1577.43$ (272)<br>(272) ÷ (4) = $15.63$ (273)<br>85.51<br>86 (274)<br>B<br>Primary Energy<br>kWh/year<br>= $3938.35$ (261)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO <sub>2</sub> , kg/year Dwelling CO <sub>2</sub> emission rate El value El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro Space heating - main system 1 Water heating  | P-CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85<br>405.85<br>VO-CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03        | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (20<br>x 0.52<br>x 0.52<br>x 0.52<br>(2<br>Primary factor<br>x 1.22<br>x 1.22  | Emissions<br>kg CO <sub>2</sub> /year<br>= 697.28 (261)<br>= 541.30 (264)<br>53) + (264) = 1238.58 (265)<br>= 128.21 (267)<br>= 210.64 (268)<br>65)(271) = 1577.43 (272)<br>(272) ÷ (4) = 15.63 (273)<br>85.51 (273)<br>866 (274)<br>B<br>Primary Energy<br>kWh/year<br>= 3938.35 (261)<br>= 3057.36 (264)   |
| 12a. CO2 emissions - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value         El rating (section 14)         El band         Space heating - main system 1         Water heating         Space and water heating   | CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85<br>405.85<br>CO-CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03          | Emission factor         kg CO <sub>2</sub> /kWh         x $0.22$ x $0.22$ (261) + (262) + (20)         x $0.52$ x $1.22$ x $1.22$ (261) + (262) + (26)   | Emissions<br>kg CO2/year= $697.28$ (261)= $541.30$ (264) $53) + (264) =$ $1238.58$ (265)= $128.21$ (267)= $210.64$ (268) $65)(271) =$ $1577.43$ (272) $(272) \div (4) =$ $15.63$ (273) $85.51$ $86$ (274) $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (264) $3057.36$ $(264)$ $3057.36$ (264) $53) + (264) =$ $6995.71$ (265)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO <sub>2</sub> , kg/year         Dwelling CO <sub>2</sub> emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans  | P-CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85<br>405.85<br>VO-CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03        | Emission factor<br>kg CO <sub>2</sub> /kWh<br>x 0.22<br>x 0.22<br>(261) + (262) + (24)<br>x 0.52<br>x 0.52<br>x 0.52<br>(2<br>Primary factor<br>x 1.22<br>x 1.22<br>(261) + (262) + (24)<br>x 3.07   | Emissions       kg CO2/year         = $697.28$ (261)         = $541.30$ (264) $53) + (264) =$ $1238.58$ (265)         = $128.21$ (267)         = $210.64$ (268) $655(271) =$ $1577.43$ (272) $(272) \div (4) =$ $15.63$ (273) $866$ (274) $866$ $866$ (274) $866$ $866$ (274) $866$ $863$ (261) $8038.35$ (261)         = $3037.36$ (264) $6995.71$ (265) $(267)$  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO <sub>2</sub> , kg/year         Dwelling CO <sub>2</sub> emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting                 | CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85<br>COCHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85 | Emission factor         kg CO <sub>2</sub> /kWh         x $0.22$ x $0.22$ (261) + (262) + (20)         x $0.52$ x $1.22$ x $1.22$ x $1.22$ x $3.07$   | Emissions<br>kg CO2/year= $697.28$ (261)= $541.30$ (264) $53) + (264) =$ $1238.58$ (265)= $128.21$ (267)= $210.64$ (268) $65)(271) =$ $1577.43$ (272) $(272) \div (4) =$ $15.63$ (273) $85.51$ $86$ (274) $86$ (274) $8$ $86$ (261) $8$ $87$ (264)(265) $87$ (265)(268) $87$ (267)(268) $87$ (268)(268) |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO <sub>2</sub> , kg/year Dwelling CO <sub>2</sub> emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Fumps and fans Electricity for lighting Pumps and fans Electricity for lighting Pumps and fans Electricity for lighting Primary energy kWh/year | -CHP<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>405.85<br>405.85<br>Energy<br>kWh/year<br>3228.16<br>2506.03<br>247.03<br>405.85         | Emission factor         kg CO <sub>2</sub> /kWh         x $0.22$ x $0.22$ x $0.52$ x $1.22$ x $1.22$ x $1.22$ x $3.07$ x $3.07$   | Emissions<br>kg CO <sub>2</sub> /year           = $697.28$ (261)           = $541.30$ (264) $53) + (264) =$ $1238.58$ (265)           = $128.21$ (267)           = $210.64$ (268) $65)(271) =$ $1577.43$ (272) $(272) \div (4) =$ $15.63$ (273) $85.51$ $86$ (274) $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $86$ (274) $8$ $83) + (264) =$ $6995.71$ (265) $=$ $758.38$ (267) $=$ $1245.95$ (268) $9000.04$ (272)  |

# 13 Appendix C – TER Worksheets (Part L 2013)

The following SAP TER worksheets are taken from the SAP 2012 software for a sample of the modelled dwellings in accordance with current London Plan policy.

The following dwellings are included as a sample – worksheets for all dwellings can be provided upon request:

1.01

1.02 2.04

2.04

3.05

4.01

4.02



| Assessor name                   | Mr John         | Simpson       |               |              |                  |                |           | Assessor nur               | nber           | 3722  |                    |                    |
|---------------------------------|-----------------|---------------|---------------|--------------|------------------|----------------|-----------|----------------------------|----------------|-------|--------------------|--------------------|
| Client                          |                 |               |               |              |                  |                |           | Last modified              | d              | 19/11 | /2014              |                    |
| Address                         | Unit 1.01       | . Marine Ice  | es Haversto   | ock Hill, Lo | ndon, NW3        | B 2BL          |           |                            |                |       |                    |                    |
|                                 |                 |               |               |              |                  |                |           |                            |                |       |                    |                    |
| 1. Overall dwelling dime        | nsions          |               |               |              |                  |                |           |                            |                |       |                    |                    |
|                                 |                 |               |               | 1            | Area (m²)        |                | Av        | erage storey<br>height (m) | I .            | Vo    | lume (m³)          |                    |
| Lowest occupied                 |                 |               |               |              | 70.20            | (1a) x         |           | 2.60                       | (2a) =         |       | 182.52             | ] (3a)             |
| Total floor area                | (1a)            | + (1b) + (1   | c) + (1d)(    | 1n) =        | 70.20            | (4)            |           |                            |                |       |                    |                    |
| Dwelling volume                 |                 |               |               |              |                  |                | (3        | a) + (3b) + (3             | 3c) + (3d)(3   | n) =  | 182.52             | <mark>] (5)</mark> |
| 2. Ventilation rate             |                 |               |               |              |                  |                |           |                            |                |       |                    |                    |
|                                 |                 |               |               |              |                  |                |           |                            |                | m     | ³ per hour         |                    |
| Number of chimneys              |                 |               |               |              |                  |                |           | 0                          | x 40 =         |       | 0                  | <mark>(6a)</mark>  |
| Number of open flues            |                 |               |               |              |                  |                |           | 0                          | x 20 =         |       | 0                  | (6b)               |
| Number of intermittent fa       | ins             |               |               |              |                  |                |           | 3                          | x 10 =         |       | 30                 | (7a)               |
| Number of passive vents         |                 |               |               |              |                  |                |           | 0                          | x 10 =         |       | 0                  | (7b)               |
| Number of flueless gas fire     | es              |               |               |              |                  |                |           | 0                          | x 40 =         |       | 0                  | (7c)               |
|                                 |                 |               |               |              |                  |                |           |                            |                | Air o | hanges per<br>hour | r                  |
| Infiltration due to chimne      | ys, flues, fans | s, PSVs       |               | (6a          | ) + (6b) + (7    | 7a) + (7b) + ( | (7c) =    | 30                         | ÷ (5) =        |       | 0.16               | (8)                |
| If a pressurisation test has    | s been carried  | d out or is i | ntended, p    | roceed to    | (17), otherv     | vise continu   | e from (9 | ) to (16)                  |                |       |                    |                    |
| Air permeability value, q5      | 0, expressed    | in cubic m    | etres per h   | our per sq   | uare metre       | of envelop     | e area    |                            |                |       | 5.00               | (17)               |
| If based on air permeabilit     | ty value, ther  | n (18) = [(17 | 7) ÷ 20] + (8 | 3), otherw   | ise (18) = (1    | L6)            |           |                            |                |       | 0.41               | (18)               |
| Number of sides on which        | the dwelling    | g is sheltere | ed            |              |                  |                |           |                            |                |       | 2                  | (19)               |
| Shelter factor                  |                 |               |               |              |                  |                |           | 1                          | - [0.075 x (19 | 9)] = | 0.85               | (20)               |
| Infiltration rate incorporation | ting shelter f  | actor         |               |              |                  |                |           |                            | (18) x (2      | .0) = | 0.35               | (21)               |
| Infiltration rate modified      | or monthly v    | wind speed    | :             |              |                  |                |           |                            |                |       |                    |                    |
| Jan                             | Feb             | Mar           | Apr           | May          | Jun              | Jul            | Aug       | Sep                        | Oct            | Nov   | Dec                |                    |
| Monthly average wind spe        | eed from Tab    | le U2         |               |              |                  |                |           | _                          |                |       |                    | _                  |
| 5.10                            | 5.00            | 4.90          | 4.40          | 4.30         | 3.80             | 3.80           | 3.70      | 4.00                       | 4.30           | 4.50  | 4.70               | (22)               |
| Wind factor (22)m ÷ 4           | _               |               |               |              | -                | -1             |           |                            |                |       |                    | -                  |
| 1.28                            | 1.25            | 1.23          | 1.10          | 1.08         | 0.95             | 0.95           | 0.93      | 1.00                       | 1.08           | 1.13  | 1.18               | (22a)              |
| Adjusted infiltration rate (    | allowing for    | shelter and   | l wind facto  | or) (21) x ( | 22a)m            | _              | 1         |                            |                |       |                    | -                  |
| 0.45                            | 0.44            | 0.43          | 0.39          | 0.38         | 0.33             | 0.33           | 0.33      | 0.35                       | 0.38           | 0.40  | 0.41               | _ (22b)            |
| Calculate effective air cha     | nge rate for t  | the applica   | ble case:     |              |                  |                |           |                            |                |       |                    | ٦                  |
| If mechanical ventilation       | on: air chang   | e rate throu  | ugh system    | ۱<br>۰ ۰     |                  |                |           |                            |                |       | N/A                | ] (23a)            |
| If balanced with heat r         | ecovery: effi   | ciency in %   | allowing fo   | or in-use fa | actor from       | i able 4h      |           |                            |                |       | N/A                | _ (23c)            |
| d) natural ventilation of       | or whole hou    | se positive   | input vent    | liation froi | n loft           | 0              | 6         |                            |                | •     |                    | ٦                  |
|                                 | 0.60            | 0.59          | 0.58          | 0.57         | 0.56             | 0.56           | 0.55      | 0.56                       | 0.57           | 0.58  | 0.59               | _ (24d)            |
| Effective air change rate -     | enter (24a) o   | or (24b) or   | (24c) or (24  | ia) in (25)  | <b>1</b> • · · · |                | -         |                            |                | e = - |                    |                    |
| 0.60                            | 0.60            | 0.59          | 0.58          | 0.57         | 0.56             | 0.56           | 0.55      | 0.56                       | 0.57           | 0.58  | 0.59               | _ (25)             |



| 3. Heat losses a   | and heat lo          | ss paramet              | er.               |                               |                            |             |              |                  |             |              |                  |              |          |
|--------------------|----------------------|-------------------------|-------------------|-------------------------------|----------------------------|-------------|--------------|------------------|-------------|--------------|------------------|--------------|----------|
| Element            |                      |                         | а                 | Gross<br>irea, m <sup>2</sup> | Openings<br>m <sup>2</sup> | Net<br>A,   | area<br>m²   | U-value<br>W/m²K | A x U V     | V/К к-<br>k. | value,<br>I/m².K | Ахк,<br>kJ/K |          |
| Window             |                      |                         |                   |                               |                            | 15          | 5.40 x       | 1.33             | = 20.4      | 2            |                  |              | (27)     |
| Door               |                      |                         |                   |                               |                            | 2           | .14 x        | 1.00             | = 2.14      | +            |                  |              | (26)     |
| Exposed floor      |                      |                         |                   |                               |                            | 70          | 0.20 x       | 0.13             | = 9.13      |              |                  |              | (28b     |
| External wall      |                      |                         |                   |                               |                            | 50          | ).02 x       | 0.18             | = 9.00      | )            |                  |              | (29a)    |
| Party wall         |                      |                         |                   |                               |                            | 32          | 2.68 x       | 0.00             | = 0.00      | )            |                  |              | (32)     |
| Total area of ext  | ernal elem           | ents ∑A, m <sup>2</sup> | 2                 |                               |                            | 13          | 7.76         |                  |             |              |                  |              | (31)     |
| Fabric heat loss,  | W/K = ∑(A            | × U)                    |                   |                               |                            |             |              |                  | (2          | 6)(30) + (   | (32) =           | 40.69        | (33)     |
| Heat capacity Cr   | n = ∑(А x к)         | )                       |                   |                               |                            |             |              | (28)             | (30) + (32) | + (32a)(3    | 32e) =           | N/A          | (34)     |
| Thermal mass pa    | arameter (1          | TMP) in kJ/r            | m²K               |                               |                            |             |              |                  |             |              |                  | 250.00       | (35)     |
| Thermal bridges    | : <u>Σ</u> (L x Ψ) с | alculated u             | sing Appen        | dix K                         |                            |             |              |                  |             |              |                  | 6.46         | (36)     |
| Total fabric heat  | loss                 |                         |                   |                               |                            |             |              |                  |             | (33) +       | (36) =           | 47.14        | (37)     |
|                    | Jan                  | Feb                     | Mar               | Apr                           | Мау                        | Jun         | Jul          | Aug              | Sep         | Oct          | Nov              | Dec          |          |
| Ventilation heat   | loss calcul          | ated month              | ily 0.33 x (2     | 25)m x (5)                    |                            |             |              |                  |             |              |                  |              |          |
|                    | 36.19                | 35.95                   | 35.72             | 34.64                         | 34.43                      | 33.49       | 33.49        | 33.31            | 33.85       | 34.43        | 34.84            | 35.27        | (38)     |
| Heat transfer co   | efficient, V         | V/K (37)m +             | + (38)m           |                               |                            |             |              |                  |             |              |                  |              |          |
|                    | 83.33                | 83.10                   | 82.87             | 81.78                         | 81.58                      | 80.63       | 80.63        | 80.46            | 81.00       | 81.58        | 81.99            | 82.42        |          |
|                    |                      |                         |                   |                               |                            |             |              |                  | Average =   | ∑(39)112     | /12 =            | 81.78        | (39)     |
| Heat loss param    | eter (HLP),          | W/m²K (39               | 9)m ÷ (4)         |                               |                            |             |              |                  |             |              |                  |              |          |
|                    | 1.19                 | 1.18                    | 1.18              | 1.16                          | 1.16                       | 1.15        | 1.15         | 1.15             | 1.15        | 1.16         | 1.17             | 1.17         |          |
|                    |                      |                         |                   |                               |                            |             |              |                  | Average =   | ∑(40)112     | /12 =            | 1.16         | (40)     |
| Number of days     | in month (           | Table 1a)               |                   |                               |                            |             |              |                  |             |              |                  |              |          |
|                    | 31.00                | 28.00                   | 31.00             | 30.00                         | 31.00                      | 30.00       | 31.00        | 31.00            | 30.00       | 31.00        | 30.00            | 31.00        | (40)     |
| A Materia          |                      | · · · · ·               |                   |                               |                            |             |              |                  |             |              |                  |              |          |
| 4. Water neath     | ig energy i          | equiremen               |                   |                               |                            |             |              |                  |             |              |                  | 2.25         |          |
| Assumed occupa     | incy, N              | ucago in litr           | oc por dou i      | Vd average                    | - (25 v NI) -              | 26          |              |                  |             |              |                  | 2.25         | (42)     |
| Annual average     | lan                  | Eeb                     | es per uay<br>Mar | vu,average                    | + (Nav                     | Jun         | 1.1          | Δυσ              | Son         | Oct          | Nov              | 87.00<br>Dec | _ (43)   |
| Hot water usage    | in litros po         | reu<br>or dou for o     | iviai             | Api                           | tor from Tab               |             | 2)           | Aug              | Seh         | 000          | NOV              | Dec          |          |
| not water usage    |                      |                         |                   | Vu,III = Iac                  |                            | 70 00       | 70 00        | 82.40            | 95.01       | 90.41        | 02.02            | 96.42        | 7        |
|                    | 90.43                | 92.92                   | 89.41             | 05.91                         | 82.40                      | 70.05       | 78.85        | 02.40            | 05.91       | 5(44)1       | 12 -             | 1051 02      |          |
| Energy content (   | of hot wate          | er used = 4             | 18 x Vd m x       | nm x Tm/                      | 3600 kWh/m                 | onth (see   | Tables 1h    | 1c 1d)           |             | ∠(44)1.      | 12               | 1051.95      | (++)     |
| Energy content (   | 143.00               | 125.07                  | 129.06            | 112 52                        | 107.96                     | 93 16       | 86.33        | 99.06            | 100.25      | 116.83       | 127 53           | 138.49       | ٦        |
|                    | 145.00               | 125.07                  | 125.00            | 112.52                        | 107.50                     | 55.10       | 00.55        | 55.00            | 100.25      | 5(45)1       | 12 =             | 1379 24      | <br>(45) |
| Distribution loss  | 0.15 x (45           | i)m                     |                   |                               |                            |             |              |                  |             | 2(13)11      |                  | 1373.21      |          |
|                    | 21.45                | 18.76                   | 19.36             | 16.88                         | 16.19                      | 13.97       | 12.95        | 14.86            | 15.04       | 17.52        | 19.13            | 20.77        | (46)     |
| Water storage lo   | oss calculat         | ed for each             | month (55         | 5) x (41)m                    |                            |             |              |                  |             |              |                  |              |          |
| 0                  | 0.00                 | 0.00                    | 0.00              | 0.00                          | 0.00                       | 0.00        | 0.00         | 0.00             | 0.00        | 0.00         | 0.00             | 0.00         | (56)     |
| If the vessel con  | tains dedic          | ated solar s            | torage or d       | ledicated V                   | VWHRS (56)r                | n x [(47) - | · Vs] ÷ (47) | , else (56)      |             |              | 1                |              |          |
|                    | 0.00                 | 0.00                    | 0.00              | 0.00                          | 0.00                       | 0.00        | 0.00         | 0.00             | 0.00        | 0.00         | 0.00             | 0.00         | (57)     |
| Primary circuit lo | oss for each         | n month fro             | m Table 3         |                               |                            |             |              |                  |             |              |                  |              |          |
|                    | 0.00                 | 0.00                    | 0.00              | 0.00                          | 0.00                       | 0.00        | 0.00         | 0.00             | 0.00        | 0.00         | 0.00             | 0.00         | (59)     |
| Combi loss for e   | ach month            | from Table              | 3a, 3b or 3       | Bc                            |                            | -           |              |                  | 4           |              |                  |              |          |
|                    | 49.14                | 42.77                   | 45.56             | 42.37                         | 41.99                      | 38.91       | 40.20        | 41.99            | 42.37       | 45.56        | 45.82            | 49.14        | (61)     |
| Total heat requi   | red for wat          | er heating o            | calculated f      | for each me                   | onth 0.85 x (              | (45)m + (4  | l6)m + (57)  | )m + (59)m       | + (61)m     |              |                  | 1            | · /      |
| ·                  | 192.14               | 167.84                  | 174.62            | 154.88                        | 149.95                     | 132.07      | 126.53       | 141.05           | 142.61      | 162.39       | 173.35           | 187.62       | (62)     |
|                    |                      | •                       | •                 | •                             |                            |             | •            |                  | 4           | •            |                  |              |          |

| Solar DHW input   | t calculated  | using Appe  | endix G or A  | Appendix H   |  |   |  |   |  |   |  |  |  |
|---|---|---|---|--|--|---|--|---|--|---|--|--|--|
|   | 0.00  | 0.00  | 0.00  | 0.00   | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00   | (63)   |
| Output from wa  | ter heater f  | or each mo  | nth (kWh/i  | month) (62   | 2)m + (63)n  | n   |  |   |  |   |  |  |  |
|   | 192.14  | 167.84  | 174.62  | 154.88   | 149.95   | 132.07  | 126.53   | 141.05  | 142.61   | 162.39  | 173.35   | 187.62   |  |
|   |   |   |   |  |  |   |  |   |  | Σ(64)1  | .12 = 1  | 905.06   | (64)   |
| Heat gains from   | water heati   | ing (kWh/m  | nonth) 0.2  | 5 × [0.85 ×  | (45)m + (6 <sup>2</sup>  | 1)ml + 0.8 x  | [(46)m + (!  | 57)m + (59)   | ml   | 2(- )   |  |  | (- <i>1</i>  |
|   | 50.92   | 52.20   | 54.20   | 48.00  | 16.20  | 40.70   | 29.76  | 12 11   | 12 02  | 50.24   | E2.96  | 50.22  | (65)   |
|   | 39.83   | J2.20   | 54.50   | 48.00  | 40.39  | 40.70   | 38.70  | 43.44   | 43.92  | 30.24   | 33.80  | 36.55  | (03)   |
| 5. Internal gain  | IS  |   |   |  |  |   |  |   |  |   |  |  |  |
|   | Jan   | Feb   | Mar   | Apr  | May  | Jun   | Jul  | Aug   | Sep  | Oct   | Nov  | Dec  |  |
| Metabolic gains   | (Table 5)   |   |   | -  | -  |   |  |   |  |   |  |  |  |
| C   | 112.55  | 112.55  | 112.55  | 112.55   | 112.55   | 112.55  | 112.55   | 112.55  | 112.55   | 112.55  | 112.55   | 112.55   | (66)   |
| Lighting gains (c   | alculated in  | Appendix I  | equation  | 19 or 19a).  | also see Ta  | able 5  |  |   |  |   |  |  | (/   |
|   | 17.64   | 15.67   | 12 74   | 9.65   | 7 21   | 6.09  | 6.58   | 8 55  | 11/18  | 14 57   | 17.01  | 18 13  | (67)   |
| Appliance gains   |   | in Annendi  |   | 0.05   | 13a) also s  | 0.05  | 0.50   | 0.55  | 11.40  | 14.57   | 17.01  | 10.15  | (07)   |
| Appliance gains   |   |   |   |  |  |   | 147.05   | 145.00  | 151.07   | 162.00  | 175.00   | 100.04   | (60)   |
|   | 197.76  | 199.82  | 194.64  | 183.03   | 169.74   | 150.08  | 147.95   | 145.90  | 151.07   | 162.08  | 175.98   | 189.04   | (68)   |
| Cooking gains (c  | alculated in  | Appendix  | L, equation   | L15 OF L15   | a), also see   |   |  |   |  |   |  |  | ()   |
|   | 34.25   | 34.25   | 34.25   | 34.25  | 34.25  | 34.25   | 34.25  | 34.25   | 34.25  | 34.25   | 34.25  | 34.25  | (69)   |
| Pump and fan ga   | ains (Table 5   | 5a)   |   |  |  | 1   |  |   |  |   |  |  |  |
|   | 3.00  | 3.00  | 3.00  | 3.00   | 3.00   | 3.00  | 3.00   | 3.00  | 3.00   | 3.00  | 3.00   | 3.00   | (70)   |
| Losses e.g. evap  | oration (Tab  | ole 5)  |   |  |  |   |  |   |  |   | •  |  |  |
|   | -90.04  | -90.04  | -90.04  | -90.04   | -90.04   | -90.04  | -90.04   | -90.04  | -90.04   | -90.04  | -90.04   | -90.04   | (71)   |
| Water heating g   | ains (Table !   | 5)  |   |  |  |   |  |   |  |   |  |  |  |
|   | 80.42   | 77.79   | 72.99   | 66.67  | 62.36  | 56.53   | 52.09  | 58.38   | 61.00  | 67.52   | 74.80  | 78.40  | (72)   |
| Total internal ga   | ins (66)m +   | (67)m + 16  | 01m 1 (60)  |  | . (71)   | 72)   |  |   |  |   |  |  |  |
| i utai internai ga  |   | - (07)11 + (0   | 6)III + (09)I   | m + (70)m  | + (/1)m + (  | 72)m  |  |   |  |   |  |  |  |
| Total internal ga   | 355.58  | 353.04  | 340.14  | m + (70)m<br>319.72  | 299.07   | 279.06  | 266.38   | 272.59  | 283.31   | 303.94  | 327.55   | 345.33   | (73)   |
|   | 355.58  | 353.04  | 340.14  | 319.72   | 299.07   | 279.06  | 266.38   | 272.59  | 283.31   | 303.94  | 327.55   | 345.33   | (73)   |
| 6. Solar gains  | 355.58  | 353.04  | 340.14  | m + (70)m<br>319.72  | 299.07   | 279.06  | 266.38   | 272.59  | 283.31   | 303.94  | 327.55   | 345.33   | (73)   |
| 6. Solar gains  | 355.58  | 353.04  | 340.14<br>Access f<br>Table   | 319.72<br>actor<br>6d  | 4 (71)11 + (<br>299.07<br>Area<br>m <sup>2</sup>   | 279.06<br>Sol   | 266.38<br>ar flux<br>//m²  | 272.59  | 283.31<br>g<br>ific data   | 303.94<br>FF  | 327.55   | 345.33<br>Gains<br>W   | (73)   |
| 6. Solar gains  | 355.58  | 353.04  | 340.14<br>Access f<br>Table   | 319.72<br>actor<br>6d  | Area<br>m <sup>2</sup>   | 279.06<br>279.06<br>Sol:<br>W   | 266.38<br>ar flux<br>//m²  | 272.59<br>speci<br>or T   | 283.31<br>g<br>ific data<br>able 6b  | 303.94<br>FF<br>specific o<br>or Table  | 327.55<br>data<br>e 6c   | 345.33<br>Gains<br>W   | (73)   |
| 6. Solar gains  | 355.58  | 353.04  | 340.14<br>Access f<br>Table   | 319.72<br>actor<br>6d  | Area<br>m <sup>2</sup><br>11.69  | 279.06<br>Sol.<br>W   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x  | 272.59<br>speci<br>or T   | g<br>ific data<br>able 6b  | 303.94<br>FF<br>specific c<br>or Table  | 327.55<br>data<br>e 6c   | 345.33<br>Gains<br>W   | (73)   |
| 6. Solar gains<br>SouthWest   | 355.58  | 353.04  | 340.14<br>Access f<br>Table<br>0.7  | 319.72<br>actor<br>6d<br>7 x [<br>7 x [  | Area<br>m <sup>2</sup><br>11.69  | 279.06<br>Sol.<br>X 3<br>X 1  | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0   | g<br>ific data<br>able 6b  | 303.94<br>FF<br>specific o<br>or Table<br>0.70<br>0.70  | 327.55   | 345.33<br>Gains<br>W<br>131.45<br>12.79  | (73)<br>(79)<br>(75)   |
| 6. Solar gains<br>SouthWest<br>NorthEast  | 355.58<br>355.74)m  | 353.04<br>(82)m   | 340.14<br>Access f<br>Table   | 319.72       actor       6d       7     x       7     x  | Area<br>m <sup>2</sup><br>11.69<br>3.71  | 279.06<br>Sol.<br>W<br>x 3<br>x 1   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0   | <b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x   | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70  | 327.55   | 345.33<br>Gains<br>W<br>131.45<br>12.79  | (73)<br>(79)<br>(75)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa   | 355.58<br>355.74)m  | (82)m   | 340.14<br>Access f<br>Table<br>0.7<br>0.7   | actor<br>6d<br>7 x (<br>7 x (  | Area<br>m <sup>2</sup><br>11.69<br>3.71  | 279.06<br>Sol.<br>X 3<br>X 1  | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0   | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x  | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70  | 327.55   | 345.33<br>Gains<br>W<br>131.45<br>12.79  | (73)<br>(79)<br>(75)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa   | 355.58       atts Σ(74)m       144.24   | (82)m<br>249.95   | 340.14<br>Access f<br>Table<br>0.7<br>353.28<br>(83)m   | 319.72       actor       6d       7     x       7     x       456.65   | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75  | 279.06<br>Sol.<br>W<br>x 3<br>x 1<br>532.52   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29   | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89  | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29  | 327.55   | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94  | (73)<br>(79)<br>(75)<br>(83)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte   | 355.58       355.58       atts Σ(74)m       144.24       ernal and so   | (82)m<br>249.95<br>lar (73)m +  | 340.14<br>Access f<br>Table<br>0.7<br>0.7<br>353.28<br>(83)m  | actor<br>6d<br>7 x (<br>7 x (<br>456.65  | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75  | 279.06<br>Sol.<br>X 3<br>X 1<br>532.52  | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29   | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89  | 303.94<br>FF<br>specific o<br>or Table<br>0.70<br>0.70<br>279.29  | 327.55<br>data<br>e 6c<br>= =<br>=<br>173.54   | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94  | (73)<br>(79)<br>(75)<br>(83)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte   | 355.58         355.58         144.24         ernal and so         499.83  | (82)m<br>249.95<br>lar (73)m +<br>602.99  | 340.14<br>Access f<br>Table<br>0.7<br>353.28<br>(83)m<br>693.41   | actor<br>6d<br>7 x [<br>7 x [<br>456.65<br>776.36  | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82  | 279.06<br>Sol.<br>W<br>X 3<br>X 1<br>532.52<br>811.58   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63                                  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29<br>727.89                                     | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89<br>672.21                                  | 303.94<br><b>FF</b><br><b>specific c</b><br><b>or Table</b><br>0.70<br>0.70<br>279.29<br>583.23             | 327.55<br>data<br>e 6c<br>= [<br>173.54<br>501.09  | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27  | (73)<br>(79)<br>(75)<br>(83)<br>(84)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte<br>7. Mean intern   | atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat  | (82)m<br>249.95<br>lar (73)m +<br>602.99  | Access f<br>Table<br>0.77<br>0.77<br>353.28<br>(83)m<br>693.41  | actor<br>6d<br>7 x (<br>7 x (<br>456.65<br>776.36  | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82  | 279.06<br>Sol<br>X 3<br>X 1<br>532.52<br>811.58   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63                                  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29<br>727.89                                     | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89<br>672.21                                  | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23                                  | 327.55<br>data<br>e 6c<br>= [<br>] = [<br>173.54<br>501.09                                       | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27  | (73)<br>(79)<br>(75)<br>(83)<br>(84)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> </ul>  | atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat<br>ring heating  | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in   | 340.14<br>Access f<br>Table<br>0.7<br>0.7<br>353.28<br>(83)m<br>693.41<br>ng season)<br>the living a  | actor<br>6d<br>7 x [<br>7 x [<br>456.65<br>776.36  | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82  | 279.06<br>Sol.<br>W<br>X 3<br>X 1<br>532.52<br>811.58   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63                                  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29<br>727.89                                     | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89<br>672.21                                  | 303.94<br><b>FF</b><br><b>specific c</b><br><b>or Table</b><br>0.70<br>0.70<br>279.29<br>583.23             | 327.55<br>data<br>e 6c<br>= [<br>] = [<br>173.54<br>501.09                                       | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27<br>21.00   | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> </ul>  | atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat<br>ring heating<br>Jan   | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in<br>Feb  | 340.14<br>Access f<br>Table<br>0.7<br>0.7<br>353.28<br>(83)m<br>693.41<br>ng season)<br>the living a<br>Mar   | actor         6d         7       x         7       x         456.65         776.36         area from T         Apr   | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>Table 9, Th:<br>May   | 279.06<br>Sol<br>X 3<br>X 1<br>532.52<br>811.58   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63                                  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29<br>727.89                                     | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>388.89<br>672.21<br>Sep                                     | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23<br>Oct                           | 327.55<br>data<br>e 6c<br>= [<br>] = [<br>173.54<br>501.09<br>Nov                                | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27<br>468.27<br>21.00<br>Dec  | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - intern</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>   | atts $\Sigma(74)$ m<br>355.58<br>144.24<br>ernal and so<br>499.83<br>al temperating<br>ring heating<br>Jan<br>r for gains for   | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>periods in<br>Feb  | 340.14<br>Access f<br>Table<br>0.7<br>353.28<br>(83)m<br>693.41<br>ng season)<br>the living a<br>Mar<br>ea n1.m (se   | actor         6d         7       x         7       x         456.65         776.36         area from 7         Apr         e Table 9a  | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>Fable 9, Th:<br>May   | 279.06<br>Sol.<br>W<br>X 3<br>X 1<br>532.52<br>811.58   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63                                  | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29<br>727.89<br>Aug                              | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89<br>672.21<br>Sep                           | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23<br>Oct                           | 327.55   | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27<br>21.00<br>Dec  | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>  | atts $\Sigma(74)$ m<br>355.58<br>atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat<br>ring heating<br>Jan<br>r for gains fo  | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in<br>Feb<br>or living are   | Access f<br>Table<br>0.77<br>0.77<br>0.77<br>353.28<br>(83)m<br>693.41<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se  | actor         6d         7       x         7       x         456.65         776.36         area from T         Apr         e Table 9a)   | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>Fable 9, Th:<br>May   | 279.06<br>Sol<br>X 3<br>X 1<br>532.52<br>811.58   | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63<br>Jul                           | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29<br>727.89<br>Aug                              | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>388.89<br>672.21<br>Sep<br>0.75                             | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23<br>Oct                           | 327.55   | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27<br>21.00<br>Dec  | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>  | atts $\Sigma(74)$ m<br>355.58<br>144.24<br>ernal and so<br>499.83<br>al temperation<br>ring heating<br>Jan<br>r for gains for<br>1.00   | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (c   | 340.14         Access f         Table         0.7         0.7         0.7         353.28         (83)m         693.41         ng season)         the living a         Mar         ca n1,m (se         0.97         tens 3 to 7                | actor         6d         7       x         7       x         456.65         776.36         area from 1         Apr         e Table 9a)         0.92         in Table 90  | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>6<br>6<br>7able 9, Th:<br>May   | 279.06<br>Sol.<br>W<br>X 3<br>X 1<br>532.52<br>811.58<br>I(°C)<br>Jun<br>0.61                                 | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63<br>Jul<br>0.45                   | 272.59<br>speci<br>or T<br>0.9 x (0<br>0.9 x (0<br>455.29<br>727.89<br>727.89<br>Aug<br>0.50            | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89<br>672.21<br>Sep<br>0.75                   | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23<br>Oct<br>0.95                   | 327.55<br>data<br>e 6c<br>= [<br>] = [<br>173.54<br>501.09<br>Nov<br>0.99                        | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27<br>21.00<br>Dec<br>1.00  | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)<br>(86)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - intern</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal tern</li> </ul>   | atts $\Sigma(74)$ m<br>355.58<br>atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat<br>ring heating<br>Jan<br>r for gains fo<br>1.00<br>emp of living   | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.99<br>g area T1 (s  | Access f<br>Table<br>0.77<br>0.77<br>0.77<br>353.28<br>(83)m<br>693.41<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se<br>0.97<br>teps 3 to 7<br>20.20  | actor         actor         6d         7       x         7       x         456.65         776.36         area from 7         Apr         e Table 9a)         0.92         in Table 90                                    | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>6<br>6<br>827.82<br>6<br>7<br>able 9, Th:<br>May<br>0.79<br>c)                            | 279.06<br>Sol<br>X 3<br>X 1<br>532.52<br>811.58<br>I(°C)<br>Jun<br>0.61                                       | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63<br>Jul<br>0.45                   | 272.59<br>speci<br>or T<br>0.9 x ()<br>455.29<br>727.89<br>727.89<br>Aug<br>0.50                        | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>388.89<br>672.21<br>Sep<br>0.75                             | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23<br>Oct<br>0.95                   | 327.55<br>data<br>e 6c<br>= [<br>] = [<br>173.54<br>501.09<br>Nov<br>Nov<br>0.99                 | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27<br>21.00<br>Dec<br>1.00  | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)<br>(86)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - intern</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal tern</li> </ul>   | atts $\Sigma(74)$ m<br>355.58<br>atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat<br>ring heating<br>Jan<br>r for gains for<br>1.00<br>emp of living<br>19.81<br>ring heating                           | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.99<br>g area T1 (s<br>20.01   | 340.14         Access f         Table         0.7         0.7         0.7         353.28         (83)m         693.41         ng season)         the living a         Mar         ca n1,m (see         0.97         teps 3 to 7         20.30 | actor         6d         7       x         7       x         456.65         776.36         area from 7         Apr         e Table 9a)         0.92         in Table 9c         20.63                                    | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>6<br>6<br>7able 9, Th:<br>May<br>0.79<br>c)<br>20.87                                      | 279.06<br>Sol.<br>W<br>X 3<br>X 1<br>532.52<br>811.58<br>I(°C)<br>Jun<br>0.61                                 | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63<br>Jul<br>0.45<br>20.99          | 272.59<br>speci<br>or T<br>0.9 x (0)<br>0.9 x (0)<br>455.29<br>727.89<br>727.89<br>Aug<br>0.50<br>20.99 | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89<br>672.21<br>Sep<br>0.75<br>20.93          | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23<br>Oct<br>0.95<br>20.60          | 327.55<br>data<br>e 6c<br>= [<br>] = [<br>] 173.54<br>501.09<br>[<br>Nov<br>0.99<br>20.14        | 345.33         Gains         W         131.45         12.79         122.94         468.27         21.00         Dec         1.00         19.78               | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)<br>(85)<br>(86)<br>(87)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains - internation</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internation</li> <li>Temperature du</li> </ul>   | atts $\Sigma(74)$ m<br>355.58<br>atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat<br>ring heating<br>Jan<br>r for gains fo<br>1.00<br>emp of living<br>19.81<br>ring heating                            | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.99<br>g area T1 (s<br>20.01<br>g periods in                           | Access f<br>Table<br>0.77<br>0.77<br>0.77<br>353.28<br>(83)m<br>693.41<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se<br>0.97<br>teps 3 to 7<br>20.30<br>the rest of   | actor         6d         7       x         7       x         456.65         776.36         area from T         Apr         e Table 9a)         0.92         in Table 9c         20.63                                    | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>528.75<br>827.82<br>528.75<br>0.79<br>c)<br>20.87<br>rom Table                            | 279.06<br>Sol.<br>X 3<br>X 1<br>532.52<br>811.58<br>I(°C)<br>Jun<br>0.61<br>20.97<br>9, Th2(°C)               | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63<br>Jul<br>0.45<br>20.99          | 272.59<br>speci<br>or T<br>0.9 x ()<br>455.29<br>727.89<br>Aug<br>0.50<br>20.99                         | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>388.89<br>672.21<br>Sep<br>0.75<br>20.93                    | 303.94<br>FF<br>specific o<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23<br>Oct<br>0.95<br>20.60          | 327.55<br>data<br>e 6c<br>= [<br>173.54<br>501.09<br>Nov<br>0.99<br>20.14                        | 345.33<br>Gains<br>W<br>131.45<br>12.79<br>122.94<br>468.27<br>21.00<br>Dec<br>1.00<br>19.78   | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> <li>(87)</li> <li>(82)</li> </ul>               |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern<br>Temperature du<br>Utilisation factor<br>Mean internal te<br>Temperature du  | atts $\Sigma(74)$ m<br>355.58<br>atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat<br>ring heating<br>Jan<br>r for gains for<br>1.00<br>emp of living<br>19.81<br>ring heating<br>19.93                  | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.99<br>g area T1 (s<br>20.01<br>g periods in<br>19.93                  | Access f<br>Table<br>0.7<br>0.7<br>0.7<br>353.28<br>(83)m<br>693.41<br>(83)m<br>693.41<br>the living a<br>Mar<br>ea n1,m (se<br>0.97<br>teps 3 to 7<br>20.30<br>the rest of<br>19.94  | actor         6d         7       x         7       x         456.65         776.36         area from 7         Apr         e Table 9a)         0.92         in Table 9c         20.63         dwelling f         19.95   | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>528.75<br>827.82<br>6<br>7able 9, Th:<br>May<br>0.79<br>c)<br>20.87<br>rom Table<br>19.95 | 279.06<br>Sol.<br>W<br>X 3<br>X 1<br>532.52<br>811.58<br>I(°C)<br>Jun<br>0.61<br>20.97<br>9, Th2(°C)<br>19.96 | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63<br>Jul<br>0.45<br>20.99<br>19.96 | 272.59<br>speci<br>or T<br>0.9 x (0)<br>455.29<br>727.89<br>727.89<br>Aug<br>0.50<br>20.99<br>19.96     | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>388.89<br>672.21<br>Sep<br>0.75<br>20.93<br>19.96 | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>279.29<br>583.23<br>Oct<br>0.95<br>20.60<br>19.95 | 327.55<br>data<br>e 6c<br>= [<br>] = [<br>173.54<br>501.09<br>[<br>Nov<br>0.99<br>20.14<br>19.95 | 345.33         Gains         W         131.45         12.79         122.94         468.27         21.00         Dec         1.00         19.78         19.94 | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)<br>(85)<br>(86)<br>(87)<br>(88)   |
| <ul> <li>6. Solar gains</li> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains - internation</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internation</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Utilisation factor</li> </ul> | atts $\Sigma(74)$ m<br>355.58<br>atts $\Sigma(74)$ m<br>144.24<br>ernal and so<br>499.83<br>al temperat<br>ring heating<br>Jan<br>r for gains fo<br>1.00<br>emp of living<br>19.81<br>ring heating<br>19.93<br>r for gains fo | (82)m<br>249.95<br>lar (73)m +<br>602.99<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.99<br>g area T1 (s<br>20.01<br>g periods in<br>19.93<br>or rest of de | Access f<br>Table<br>0.77<br>0.77<br>0.77<br>353.28<br>(83)m<br>693.41<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se<br>0.97<br>teps 3 to 7<br>20.30<br>the rest of<br>19.94<br>welling n2,0  | actor         6d         7       x         7       x         456.65         776.36         area from T         Apr         e Table 9a)         0.92         in Table 9c         20.63         6 dwelling f         19.95 | Area<br>m <sup>2</sup><br>11.69<br>3.71<br>528.75<br>827.82<br>528.75<br>827.82<br>528.75<br>0.79<br>0.79<br>c)<br>20.87<br>rom Table<br>19.95           | 279.06<br>Sol.<br>X 3<br>X 1<br>532.52<br>811.58<br>I(°C)<br>Jun<br>0.61<br>20.97<br>9, Th2(°C)<br>19.96      | 266.38<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>510.25<br>776.63<br>Jul<br>0.45<br>20.99<br>19.96 | 272.59<br>speci<br>or T<br>0.9 x ()<br>455.29<br>727.89<br>727.89<br>0.50<br>20.99<br>19.96             | 283.31<br>g<br>ific data<br>able 6b<br>0.63 x<br>388.89<br>672.21<br>Sep<br>0.75<br>20.93<br>19.96           | 303.94<br>FF<br>specific c<br>or Table<br>0.70<br>279.29<br>583.23<br>Oct<br>0.95<br>20.60<br>19.95         | 327.55<br>data<br>e 6c<br>= [<br>173.54<br>501.09<br>501.09<br>Nov<br>Nov<br>0.99<br>20.14       | 345.33         Gains         W         131.45         12.79         122.94         468.27         21.00         Dec         1.00         19.78         19.94 | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> <li>(87)</li> <li>(88)</li> <li>(88)</li> </ul> |

| Mean internal t    | emperature    | e in the rest     | of dwelling  | g T2 (follow | steps 3 to    | 7 in Table 9 | Əc)    |        |          |               |                |         |                  |
|--------------------|---------------|-------------------|--------------|--------------|---------------|--------------|--------|--------|----------|---------------|----------------|---------|------------------|
|                    | 18.36         | 18.66             | 19.06        | 19.53        | 19.83         | 19.94        | 19.96  | 19.96  | 19.90    | 19.51         | 18.85          | 18.32   | (90)             |
| Living area fract  | ion           |                   |              |              |               |              |        |        | Liv      | ving area ÷   | (4) =          | 0.37    | (91)             |
| Mean internal t    | emperature    | for the wh        | nole dwellin | g fLA x T1 + | +(1 - fLA) x  | Т2           |        |        |          |               |                |         |                  |
|                    | 18.90         | 19.16             | 19.52        | 19.94        | 20.21         | 20.32        | 20.34  | 20.34  | 20.28    | 19.91         | 19.33          | 18.86   | (92)             |
| Apply adjustme     | nt to the me  | ean interna       | l temperatu  | ure from Ta  | able 4e whe   | ere appropr  | iate   |        |          |               |                |         |                  |
|                    | 18.90         | 19.16             | 19.52        | 19.94        | 20.21         | 20.32        | 20.34  | 20.34  | 20.28    | 19.91         | 19.33          | 18.86   | (93)             |
|                    |               |                   |              |              |               |              |        |        |          |               |                |         |                  |
| 8. Space heati     | ng requirem   | ient              |              | -            |               |              |        | _      |          | •             | <b>.</b> .     | _       |                  |
|                    | Jan           | Feb               | Mar          | Apr          | way           | Jun          | Jul    | Aug    | Sep      | Oct           | Nov            | Dec     |                  |
| Utilisation facto  | r for gains,  | ηm                | 0.00         | 0.00         | 0.75          | 0.55         | 0.00   | 0.42   | 0.60     | 0.00          | 0.00           |         |                  |
|                    | 0.99          | 0.98              | 0.96         | 0.89         | 0.75          | 0.55         | 0.39   | 0.43   | 0.69     | 0.92          | 0.98           | 0.99    | ] (94)           |
| Oserui gains, nn   |               | +)III X (84)II    |              | C00.0C       | 622.66        | 440.47       | 200.10 | 214.22 | 465.44   | 527.50        | 402.05         | 465.62  |                  |
| Monthly avorage    | 496.04        | 592.05            | 663.07       | 089.80       | 622.66        | 449.47       | 300.10 | 314.33 | 465.44   | 537.58        | 492.95         | 405.02  | ] (95)           |
| wontiny averag     |               |                   |              |              | 11 70         | 14.00        | 16.60  | 16.40  | 14.10    | 10.00         | 7.10           | 4.20    |                  |
| Heat loss rate fr  | 4.30          | 4.90              | oratura lm   | 8.90         | 11.70         | (06)ml       | 16.60  | 16.40  | 14.10    | 10.60         | 7.10           | 4.20    | ] (96)           |
|                    |               |                   |              |              | 1 X [(93)11 - |              | 201.00 | 217.07 | F00 F7   | 750.05        | 1002.00        | 1200.04 |                  |
| Space beating r    | 1210.44       | 1184.79           | 1078.85      | [902.53]     | [094.23]      | 401.51<br>m  | 301.09 | 317.07 | 500.57   | 759.85        | 1002.68        | 1208.04 | ] (97)           |
|                    |               | 200 22            | 200.24       | 152 12       | 5/11] × (41)  | 0.00         | 0.00   | 0.00   | 0.00     | 165.26        | 267.00         | 552.26  | 1                |
|                    | 555.56        | 350.32            | 505.54       | 155.12       | 55.25         | 0.00         | 0.00   | 0.00   | <br><br> | 105.50        | 12 - 507.00    | 532.30  | ]<br>] (08)      |
| Snace heating r    | auirement     | $kM/h/m^2/y$      | ear          |              |               |              |        |        | 2(36     | (08)          | .12 - <u> </u> | 26 11   | ] (90)<br>] (90) |
|                    | equitement    | K V V II / II / Y | ear          |              |               |              |        |        |          | (98)          | . (4)          | 50.11   | ] (33)           |
| 9a. Energy req     | uirements -   | · individual      | heating sys  | stems inclu  | iding micro   | -CHP         |        |        |          |               |                |         |                  |
| Space heating      |               |                   |              |              |               |              |        |        |          |               |                |         |                  |
| Fraction of space  | e heat from   | secondary         | /suppleme    | ntary syste  | m (table 11   | L)           |        |        |          |               |                | 0.00    | (201)            |
| Fraction of spac   | e heat from   | n main syste      | em(s)        |              |               |              |        |        |          | 1 - (2        | 01) =          | 1.00    | (202)            |
| Fraction of spac   | e heat from   | n main syste      | em 2         |              |               |              |        |        |          |               |                | 0.00    | (202)            |
| Fraction of tota   | l space heat  | from main         | system 1     |              |               |              |        |        | (20      | 02) x [1- (20 | 3)] =          | 1.00    | (204)            |
| Fraction of tota   | l space heat  | from main         | system 2     |              |               |              |        |        |          | (202) x (2    | 03) =          | 0.00    | (205)            |
| Efficiency of ma   | in system 1   | (%)               |              |              |               |              |        |        |          |               |                | 93.40   | (206)            |
|                    | Jan           | Feb               | Mar          | Apr          | May           | Jun          | Jul    | Aug    | Sep      | Oct           | Nov            | Dec     |                  |
| Space heating f    | uel (main sy  | stem 1), kV       | Wh/month     |              |               |              |        |        |          |               |                |         |                  |
|                    | 573.86        | 426.47            | 331.20       | 163.94       | 57.01         | 0.00         | 0.00   | 0.00   | 0.00     | 177.05        | 392.94         | 591.40  | ]                |
|                    |               |                   |              |              |               |              |        |        | ∑(212    | 1)15, 10      | .12 = 2        | 2713.86 | (211)            |
| Water heating      |               |                   |              |              |               |              |        |        |          |               |                |         |                  |
| Efficiency of wa   | ter heater    |                   |              |              |               |              |        |        |          |               |                |         | _                |
|                    | 87.50         | 87.15             | 86.48        | 85.02        | 82.72         | 80.30        | 80.30  | 80.30  | 80.30    | 85.10         | 86.89          | 87.61   | (217)            |
| Water heating f    | uel, kWh/m    | onth              |              |              |               |              |        |        |          |               |                |         | _                |
|                    | 219.59        | 192.58            | 201.93       | 182.16       | 181.27        | 164.47       | 157.57 | 175.66 | 177.60   | 190.83        | 199.50         | 214.17  |                  |
|                    |               |                   |              |              |               |              |        |        |          | ∑(219a)1      | .12 = 2        | 2257.34 | (219)            |
| Annual totals      |               |                   |              |              |               |              |        |        |          |               |                |         | -                |
| Space heating for  | uel - main sy | ystem 1           |              |              |               |              |        |        |          |               |                | 2713.86 |                  |
| Water heating f    | uel           |                   |              |              |               |              |        |        |          |               |                | 2257.34 |                  |
| Electricity for pu | umps, fans a  | and electric      | : keep-hot ( | Table 4f)    |               |              |        | ,      |          | -             |                |         |                  |
| central heat       | ng pump or    | r water pun       | np within w  | arm air hea  | ating unit    |              |        |        | 30.00    | ]             |                |         | (230c)           |
| boiler flue fa     | n             |                   |              |              |               |              |        |        | 45.00    | ]             |                |         | (230e)           |
| Total electricity  | for the abo   | ve, kWh/ve        | ear          |              |               |              |        |        |          |               |                | 75.00   | (231)            |

10a. Fuel costs - individual heating systems including micro-CHP

(232) (238)

311.50

5357.70

|   | Fuel     |   | Fuel price             |                 | Fuel        |       |
|---|----------|---|------------------------|-----------------|-------------|-------|
|   | kWh/year |   |                        |                 | cost £/year | _     |
| Space heating - main system 1   | 2713.86  | х | 3.48                   | x 0.01 =        | 94.44       | (240) |
| Water heating   | 2257.34  | х | 3.48                   | x 0.01 =        | 78.56       | (247) |
| Pumps and fans  | 75.00    | х | 13.19                  | x 0.01 =        | 9.89        | (249) |
| Electricity for lighting  | 311.50   | х | 13.19                  | x 0.01 =        | 41.09       | (250) |
| Additional standing charges   |          |   |                        |                 | 120.00      | (251) |
| Total energy cost   |          |   | (240)(242) +           | - (245)(254) =  | 343.98      | (255) |
|   |          |   |                        |                 |             |       |
| 11a. SAP rating - individual heating systems including micro-CH             | IP       |   |                        |                 |             |       |
| Energy cost deflator (Table 12)   |          |   |                        |                 | 0.42        | (256) |
| Energy cost factor (ECF)  |          |   |                        |                 | 1.25        | (257) |
| SAP value   |          |   |                        |                 | 82.51       | ]     |
| SAP rating (section 13)   |          |   |                        |                 | 83          | (258) |
| SAP band  |          |   |                        |                 | В           | ]     |
|   |          |   |                        |                 |             |       |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro | o-CHP    | - |                        |                 |             |       |
|   | Energy   |   | <b>Emission factor</b> |                 | Emissions   |       |
|   | kWh/year |   | kg CO₂/kWh             |                 | kg CO₂/year |       |
| Space heating - main system 1   | 2713.86  | x | 0.22                   | =               | 586.19      | (261) |
| Water heating   | 2257.34  | x | 0.22                   | =               | 487.59      | (264) |
| Space and water heating   |          |   | (261) + (262) +        | (263) + (264) = | 1073.78     | (265) |
| Pumps and fans  | 75.00    | x | 0.52                   | =               | 38.93       | (267) |
| Electricity for lighting  | 311.50   | x | 0.52                   | =               | 161.67      | (268) |

Total CO₂, kg/year

Dwelling CO<sub>2</sub> emission rate

El value

El rating (section 14)

EI band

| 13a. P | rimary energy - | individual heating | svstems including | z micro-CHP |
|--------|-----------------|--------------------|-------------------|-------------|

|  | Energy<br>kWh/year |   | Primary factor  |                 | Primary Energy<br>kWh/year | ,     |
|--|--------------------|---|-----------------|-----------------|----------------------------|-------|
| Space heating - main system 1            | 2713.86            | x | 1.22            | =               | 3310.90                    | (261) |
| Water heating                            | 2257.34            | х | 1.22            | =               | 2753.96                    | (264) |
| Space and water heating                  |                    |   | (261) + (262) + | (263) + (264) = | 6064.86                    | (265) |
| Pumps and fans                           | 75.00              | x | 3.07            | =               | 230.25                     | (267) |
| Electricity for lighting                 | 311.50             | x | 3.07            | =               | 956.31                     | (268) |
| Primary energy kWh/year                  |                    |   |                 |                 | 7251.42                    | (272) |
| Dwelling primary energy rate kWh/m2/year |                    |   |                 |                 | 103.30                     | (273) |

1274.37

18.15

85.18

85

В

(265)...(271) =

(272) ÷ (4) =

(272)

(273)

(274)



| Assessor name               | Mr John         | Simpson        |               |              |                |                     |           | Assessor nur               | nber           | 3722  |                    |            |
|-----------------------------|-----------------|----------------|---------------|--------------|----------------|---------------------|-----------|----------------------------|----------------|-------|--------------------|------------|
| Client                      |                 |                |               |              |                |                     |           | Last modified              | b              | 19/11 | /2014              |            |
| Address                     | Unit 1.0        | 2 Marine Ice   | es Haversto   | ock Hill, Lo | ndon, NW3      | 3 2BL               |           |                            |                |       |                    |            |
|                             |                 |                |               |              | -              |                     |           |                            |                |       |                    |            |
| 1. Overall dwelling dim     | ensions         |                |               |              |                |                     |           |                            |                |       |                    |            |
|                             |                 |                |               | 1            | Area (m²)      |                     | Av        | erage storey<br>height (m) | 1              | Va    | lume (m³)          |            |
| Lowest occupied             |                 |                |               |              | 49.80          | <mark>(1a)</mark> x |           | 2.60                       | (2a) =         |       | 129.48             | (3a)       |
| Total floor area            | (1a)            | ) + (1b) + (1  | c) + (1d)(    | 1n) =        | 49.80          | (4)                 |           |                            |                |       |                    |            |
| Dwelling volume             |                 |                |               |              |                |                     | (3        | a) + (3b) + (3             | 3c) + (3d)(3   | n) =  | 129.48             | <b>(5)</b> |
| 2. Ventilation rate         |                 |                |               |              |                |                     |           |                            |                |       |                    |            |
|                             |                 |                |               |              |                |                     |           |                            |                | m     | ³ per hour         |            |
| Number of chimneys          |                 |                |               |              |                |                     |           | 0                          | x 40 =         |       | 0                  | (6a)       |
| Number of open flues        |                 |                |               |              |                |                     |           | 0                          | x 20 =         |       | 0                  | (6b)       |
| Number of intermittent      | fans            |                |               |              |                |                     |           | 2                          | x 10 =         |       | 20                 | (7a)       |
| Number of passive vents     |                 |                |               |              |                |                     |           | 0                          | x 10 =         |       | 0                  | (7b)       |
| Number of flueless gas fi   | res             |                |               |              |                |                     |           | 0                          | x 40 =         |       | 0                  | (7c)       |
|                             |                 |                |               |              |                |                     |           |                            |                | Air o | hanges pe:<br>hour | r          |
| Infiltration due to chimn   | eys, flues, fan | is, PSVs       |               | (6a          | ı) + (6b) + (7 | 7a) + (7b) + (      | (7c) =    | 20                         | ÷ (5) =        |       | 0.15               | (8)        |
| If a pressurisation test ha | as been carrie  | ed out or is i | ntended, p    | roceed to    | (17), otherv   | wise continu        | e from (9 | ) to (16)                  |                |       |                    |            |
| Air permeability value, q   | 50, expressed   | l in cubic m   | etres per h   | our per so   | luare metre    | e of envelop        | e area    |                            |                |       | 5.00               | (17)       |
| If based on air permeabi    | lity value, the | n (18) = [(1   | 7) ÷ 20] + (8 | 3), otherw   | ise (18) = (1  | 16)                 |           |                            |                |       | 0.40               | (18)       |
| Number of sides on whic     | h the dwellin   | g is sheltere  | ed            |              |                |                     |           |                            |                |       | 2                  | (19)       |
| Shelter factor              |                 |                |               |              |                |                     |           | 1                          | - [0.075 x (19 | 9)] = | 0.85               | (20)       |
| Infiltration rate incorpor  | ating shelter f | factor         |               |              |                |                     |           |                            | (18) x (2      | .0) = | 0.34               | (21)       |
| Infiltration rate modified  | for monthly     | wind speed     | :             |              |                |                     |           |                            |                |       |                    |            |
| Jan                         | Feb             | Mar            | Apr           | May          | Jun            | Jul                 | Aug       | Sep                        | Oct            | Nov   | Dec                |            |
| Monthly average wind s      | beed from Tal   | ble U2         |               |              |                |                     |           |                            |                |       |                    | _          |
| 5.10                        | 5.00            | 4.90           | 4.40          | 4.30         | 3.80           | 3.80                | 3.70      | 4.00                       | 4.30           | 4.50  | 4.70               | (22)       |
| Wind factor (22)m ÷ 4       |                 | _              |               |              |                | _                   |           |                            |                |       |                    | _          |
| 1.28                        | 1.25            | 1.23           | 1.10          | 1.08         | 0.95           | 0.95                | 0.93      | 1.00                       | 1.08           | 1.13  | 1.18               | (22a)      |
| Adjusted infiltration rate  | (allowing for   | shelter and    | d wind fact   | or) (21) x ( | 22a)m          |                     |           |                            |                |       |                    | _          |
| 0.44                        | 0.43            | 0.42           | 0.38          | 0.37         | 0.33           | 0.33                | 0.32      | 0.34                       | 0.37           | 0.39  | 0.40               | (22b)      |
| Calculate effective air ch  | ange rate for   | the applica    | ble case:     |              |                |                     |           |                            |                |       |                    | -          |
| If mechanical ventilat      | ion: air chang  | ge rate thro   | ugh system    |              |                |                     |           |                            |                |       | N/A                | _ (23a)    |
| If balanced with heat       | recovery: eff   | iciency in %   | allowing fo   | or in-use f  | actor from     | Table 4h            |           |                            |                |       | N/A                | _ (23c)    |
| d) natural ventilation      | or whole hou    | ise positive   | input vent    | lation from  | m loft         | -                   | 1 -       | -                          | 1 - 1          |       |                    | 7          |
| 0.60                        | 0.59            | 0.59           | 0.57          | 0.57         | 0.55           | 0.55                | 0.55      | 0.56                       | 0.57           | 0.57  | 0.58               | _ (24d)    |
| Effective air change rate   | - enter (24a)   | or (24b) or    | (24c) or (24  | 1d) in (25)  |                | 1 -                 |           |                            | 1 - 1          |       |                    | ارمار      |
| 0.60                        | 0.59            | 0.59           | 0.57          | 0.57         | 0.55           | 0.55                | 0.55      | 0.56                       | 0.57           | 0.57  | 0.58               | _ (25)     |



| 3. Heat losses a   | and heat lo  | ss paramet     | er          |                   |                            |             |                |                  |             |              |                  |              |                  |
|--------------------|--------------|----------------|-------------|-------------------|----------------------------|-------------|----------------|------------------|-------------|--------------|------------------|--------------|------------------|
| Element            |              |                | a           | Gross<br>area, m² | Openings<br>m <sup>2</sup> | Net<br>A    | t area<br>, m² | U-value<br>W/m²K | A x U V     | V/К к-<br>kJ | value,<br>l/m².K | Ахк,<br>kJ/K |                  |
| Window             |              |                |             |                   |                            | 10          | 0.31 x         | 1.33             | = 13.6      | 7            |                  |              | (27)             |
| Door               |              |                |             |                   |                            | 2           | .14 x          | 1.00             | = 2.14      | Ļ            |                  |              | (26)             |
| Exposed floor      |              |                |             |                   |                            | 49          | 9.80 x         | 0.13             | = 6.47      | ,            |                  |              | (28b             |
| External wall      |              |                |             |                   |                            | 51          | 1.54 x         | 0.18             | = 9.28      | 3            |                  |              | (29a)            |
| Party wall         |              |                |             |                   |                            | 13          | 3.34 x         | 0.00             | = 0.00      | )            |                  |              | (32)             |
| Total area of ext  | ernal elem   | ents ∑A, m²    |             |                   |                            | 11          | .3.79          |                  |             |              |                  |              | (31)             |
| Fabric heat loss,  | W/K = ∑(A    | × U)           |             |                   |                            |             |                |                  | (2          | (30) + (     | (32) =           | 31.56        | (33)             |
| Heat capacity Cr   | n = ∑(А x к) |                |             |                   |                            |             |                | (28)             | (30) + (32) | + (32a)(3    | 2e) =            | N/A          | (34)             |
| Thermal mass pa    | arameter (1  | TMP) in kJ/n   | n²K         |                   |                            |             |                |                  |             |              |                  | 250.00       | (35)             |
| Thermal bridges    | : Σ(L x Ψ) c | alculated us   | ing Appen   | idix K            |                            |             |                |                  |             |              |                  | 5.02         | (36)             |
| Total fabric heat  | loss         |                |             |                   |                            |             |                |                  |             | (33) + (     | (36) =           | 36.58        | (37)             |
|                    | Jan          | Feb            | Mar         | Apr               | May                        | Jun         | Jul            | Aug              | Sep         | Oct          | Nov              | Dec          |                  |
| Ventilation heat   | loss calcula | ated month     | ly 0.33 x ( | 25)m x (5)        |                            |             |                |                  |             |              |                  |              |                  |
|                    | 25.47        | 25.31          | 25.15       | 24.42             | 24.28                      | 23.64       | 23.64          | 23.52            | 23.89       | 24.28        | 24.56            | 24.85        | (38)             |
| Heat transfer co   | efficient, W | //K (37)m +    | - (38)m     |                   |                            |             |                |                  |             |              |                  |              |                  |
|                    | 62.05        | 61.89          | 61.73       | 61.00             | 60.86                      | 60.22       | 60.22          | 60.11            | 60.47       | 60.86        | 61.14            | 61.43        |                  |
|                    |              |                |             |                   |                            |             |                |                  | Average =   | ∑(39)112     | /12 =            | 61.00        | (39)             |
| Heat loss param    | eter (HLP),  | W/m²K (39      | 9)m ÷ (4)   |                   |                            |             |                |                  |             |              |                  |              |                  |
|                    | 1.25         | 1.24           | 1.24        | 1.22              | 1.22                       | 1.21        | 1.21           | 1.21             | 1.21        | 1.22         | 1.23             | 1.23         |                  |
|                    |              |                |             |                   |                            |             |                |                  | Average =   | ∑(40)112     | /12 =            | 1.22         | (40)             |
| Number of days     | in month (   | Table 1a)      |             |                   |                            |             |                |                  |             |              |                  |              |                  |
|                    | 31.00        | 28.00          | 31.00       | 30.00             | 31.00                      | 30.00       | 31.00          | 31.00            | 30.00       | 31.00        | 30.00            | 31.00        | (40)             |
| / Water beatin     | ag opergy r  | equiremen      | +           |                   |                            |             |                |                  |             |              |                  |              |                  |
| Assumed assume     |              | equiremen      | L .         |                   |                            |             |                |                  |             |              |                  | 1 6 9        |                  |
| Assumed occupa     | hot wator i  | usago in litre | as par day  | Vd avorage        | o − (25 v N) ±             | 26          |                |                  |             |              |                  | 74.20        | _ (42)<br>_ (42) |
| Annual average     | lan          | Feh            | Mar         | Δnr               | = (23 x N) +<br>Mav        | lun         | Int            | Διισ             | Sen         | Oct          | Nov              | 74.20<br>Dec | _ (43)           |
| Hot water usage    | in litres ne | er day for ea  | sch month   | Vd m = fac        | tor from Tab               | le 1c x (4  | 3)             | Avb.             | Sch         | 000          | 1101             | Dee          |                  |
| not water usuge    | 81 62        | 78 65          | 75.68       | 72 72             | 69.75                      | 66 78       | 66 78          | 69.75            | 72 72       | 75.68        | 78.65            | 81.62        | ٦                |
|                    | 01.02        | 78.05          | 75.00       | 12.12             | 05.75                      | 00.70       | 00.70          | 05.75            | 12.12       | 5(44)1       | 12 =             | 890.40       | <br>☐ (44)       |
| Energy content (   | of hot wate  | r used = 4.1   | 8 x Vd m y  | x nm x Tm/        | 3600 kWh/m                 | onth (see   | - Tables 1h    | 1c 1d)           |             | 2(++)1.      |                  | 050.40       | (++)             |
| 2.10.87 00110111   | 121.04       | 105.86         | 109 24      | 95.24             | 91 38                      | 78 86       | 73.07          | 83.85            | 84 85       | 98 89        | 107 94           | 117 22       | ٦                |
|                    | 121.01       | 105.00         | 105.21      | 55.21             | 51.50                      | 70.00       | 75.07          | 00.00            | 0 1100      | Σ(45)1       |                  | 1167.46      | _<br>☐ (45)      |
| Distribution loss  | 0.15 x (45   | )m             |             |                   |                            |             |                |                  |             | 2(10)20      |                  | 1107110      |                  |
|                    | 18.16        | 15.88          | 16.39       | 14.29             | 13.71                      | 11.83       | 10.96          | 12.58            | 12.73       | 14.83        | 16.19            | 17.58        | (46)             |
| Water storage lo   | oss calculat | ed for each    | month (5    | 5) x (41)m        |                            |             |                |                  |             |              |                  |              |                  |
| C C                | 0.00         | 0.00           | 0.00        | 0.00              | 0.00                       | 0.00        | 0.00           | 0.00             | 0.00        | 0.00         | 0.00             | 0.00         | <b>(56)</b>      |
| If the vessel cont | tains dedic  | ated solar s   | torage or o | dedicated V       | WWHRS (56)r                | m x [(47) · | - Vs] ÷ (47)   | , else (56)      |             |              |                  |              | _ (***           |
|                    | 0.00         | 0.00           | 0.00        | 0.00              | 0.00                       | 0.00        | 0.00           | 0.00             | 0.00        | 0.00         | 0.00             | 0.00         | (57)             |
| Primary circuit lo | oss for each | n month fro    | m Table 3   |                   |                            |             | -1             |                  | -1          |              |                  |              | _ • •            |
|                    | 0.00         | 0.00           | 0.00        | 0.00              | 0.00                       | 0.00        | 0.00           | 0.00             | 0.00        | 0.00         | 0.00             | 0.00         | (59)             |
| Combi loss for ea  | ach month    | from Table     | 3a, 3b or 3 | Bc                |                            |             |                | -                | -1          |              |                  | 1            | _ · · /          |
|                    | 41.59        | 36.20          | 38.57       | 35.86             | 35.54                      | 32.93       | 34.03          | 35.54            | 35.86       | 38.57        | 38.79            | 41.59        | (61)             |
| Total heat requi   | red for wat  | er heating o   | alculated   | for each m        | onth 0.85 x (              | (45)m + (4  | 46)m + (57)    | )m + (59)m       | + (61)m     |              | -                |              |                  |
|                    | 162.63       | 142.06         | 147.81      | 131.10            | 126.93                     | 111.79      | 107.10         | 119.40           | 120.71      | 137.46       | 146.73           | 158.81       | (62)             |
|                    |              |                |             |                   |                            |             |                |                  |             |              |                  |              |                  |

|  | t calculated   | using Appe  |  | sppenuix n   |  |   |  |   |  |   |   |  |  |
|--|--|---|--|--|--|---|--|---|--|---|---|--|--|
|  | 0.00   | 0.00  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00  | 0.00   | (63)   |
| Output from wa   | ter heater fo  | or each mo  | nth (kWh/i   | month) (62   | 2)m + (63)n  | n   |  |   |  |   |   |  |  |
|  | 162.63   | 142.06  | 147.81   | 131.10   | 126.93   | 111.79  | 107.10   | 119.40  | 120.71   | 137.46  | 146.73  | 158.81   | ]  |
|  |  |   |  |  | -  |   |  |   |  | Σ(64)1  | .12 = 1   | 612.53   | (64)   |
| Heat gains from  | water heati  | ing (kWh/m  | nonth) 0.2   | 5 × [0.85 ×  | (45)m + (6 <sup>2</sup>  | 1)ml + 0.8 x  | [(46)m + (   | 57)m + (59  | )ml  | 2(- )   |   |  |  |
|  | 50.64  | 44.25   | 15.06  | 10.62  | 20.27  | 24.45   | 22.80  | 26 77   | 27.19  | 12 52   | 15 50   | 10.27  | (65)   |
|  | 50.04  | 44.23   | 43.90  | 40.05  | 35.27  | 54.45   | 32.80  | 50.77   | 57.10  | 42.32   | 45.55   | 49.37  | [(03)  |
| 5. Internal gain   | IS   |   |  |  |  |   |  |   |  |   |   |  |  |
|  | Jan  | Feb   | Mar  | Apr  | May  | Jun   | Jul  | Aug   | Sep  | Oct   | Nov   | Dec  |  |
| Metabolic gains  | (Table 5)  |   |  |  |  |   |  | Ū   |  |   |   |  |  |
|  | 84.21  | 84 21   | 84 21  | 84 21  | 84.21  | 84.21   | 84 21  | 84.21   | 84.21  | 84 21   | 84.21   | 84.21  | (66)   |
| Lighting gains (c  | alculated in   | Annendix I  | equation   | 19 or 19a)   | also see Ta  | able 5  | 01.21  | 0.121   | 0.21   | 01121   | 01.21   | 01.21  | ] (00)   |
|  | 12 12  | 11.66   | 0.49   | 7 19   | 5 27   | 1 52  | 4.00   | 6.26  | 9 5 4  | 10.95   | 12.66   | 12.40  | (67)   |
| Appliance gains  | (calculated  | in Annondi  |  | 7.10   | 12a) also s  | - 4.55  | 4.50   | 0.50  | 0.54   | 10.85   | 12.00   | 13.49  | [(07]  |
| Appliance gains  |  |   |  |  |  |   | 100 70   | 100.04  | 442.07   | 120.24  | 400.55  | 440.24   |  |
| o 1  | 146.71   | 148.24  | 144.40   |  | 125.92   | 116.23  | 109.76   | 108.24  | 112.07   | 120.24  | 130.55  | 140.24   | (68)   |
| Cooking gains (c   | alculated in   | Appendix  | L, equation  | L15 or L15   | a), also see   | e Table 5   |  |   |  |   |   | 1  | 1  |
|  | 31.42  | 31.42   | 31.42  | 31.42  | 31.42  | 31.42   | 31.42  | 31.42   | 31.42  | 31.42   | 31.42   | 31.42  | (69)   |
| Pump and fan ga  | ains (Table 5  | ia)   |  |  |  |   |  |   |  |   |   |  | 1  |
|  | 3.00   | 3.00  | 3.00   | 3.00   | 3.00   | 3.00  | 3.00   | 3.00  | 3.00   | 3.00  | 3.00  | 3.00   | (70)   |
| Losses e.g. evap   | oration (Tab   | ole 5)  |  |  |  |   |  |   |  |   |   |  |  |
|  | -67.37   | -67.37  | -67.37   | -67.37   | -67.37   | -67.37  | -67.37   | -67.37  | -67.37   | -67.37  | -67.37  | -67.37   | (71)   |
| Water heating g  | ains (Table !  | 5)  |  |  |  |   |  |   |  |   |   |  |  |
|  | 68.07  | 65.85   | 61.78  | 56.43  | 52.78  | 47.85   | 44.09  | 49.42   | 51.64  | 57.15   | 63.32   | 66.36  | (72)   |
| Total internal ga  | ins (66)m +  | · (67)m + (6  | i8)m + (69)i   | m + (70)m ·  | + (71)m + (  | 72)m  |  |   |  |   |   |  |  |
|  |  |   |  |  |  |   |  |   |  |   |   |  |  |
|  | 279.18   | 277.01  | 266.93   | 251.11   | 235.34   | 219.88  | 210.01   | 215.28  | 223.52   | 239.50  | 257.79  | 271.36   | (73)   |
| 6. Solar gains   | 279.18   | 277.01  | 266.93   | 251.11   | 235.34   | 219.88  | 210.01   | 215.28  | 223.52   | 239.50  | 257.79  | 271.36   | (73)   |
| 6. Solar gains   | 279.18   | 277.01  | 266.93<br>Access f   | 251.11   | 235.34<br>Area   | 219.88<br>Sol   | 210.01<br>ar flux  | 215.28  | 223.52<br>g  | 239.50<br>FF  | 257.79  | 271.36<br>Gains  | (73)   |
| 6. Solar gains   | 279.18   | 277.01  | 266.93<br>Access f<br>Table  | 251.11<br>actor<br>6d  | 235.34<br>Area<br>m <sup>2</sup>   | 219.88<br>Sol   | 210.01<br>ar flux<br>//m²  | 215.28<br>spec  | g<br>ific data   | 239.50<br>FF<br>specific c  | 257.79  | 271.36<br>Gains<br>W   | (73)   |
| 6. Solar gains   | 279.18   | 277.01  | 266.93<br>Access f<br>Table  | 251.11<br>actor<br>6d  | 235.34<br>Area<br>m²   | 219.88<br>Sol.<br>W   | 210.01<br>ar flux<br>//m²  | 215.28<br>spec<br>or T  | g<br>ific data<br>able 6b  | 239.50<br>FF<br>specific c<br>or Table  | 257.79<br>data<br>e 6c  | 271.36<br>Gains<br>W   | (73)   |
| 6. Solar gains<br>SouthWest  | 279.18   | 277.01  | 266.93<br>Access f<br>Table  | 251.11<br>actor<br>6d<br>7 x [   | 235.34<br>Area<br>m <sup>2</sup><br>7.15   | 219.88<br>Sol<br>X 3  | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x  | 215.28<br>spec<br>or T<br>0.9 x   | g<br>sific data<br>able 6b   | FF<br>specific c<br>or Table  | 257.79<br>data<br>e 6c  | 271.36<br>Gains<br>W<br>80.40  | (73)   |
| 6. Solar gains<br>SouthWest<br>NorthEast   | 279.18   | 277.01  | 266.93<br>Access f<br>Table<br>0.7<br>0.7  | 251.11<br>actor<br>6d<br>7 x (<br>7 x (  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16   | 219.88<br>Sol.<br>X<br>X<br>X<br>1  | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x  | g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x  | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70  | 257.79<br>data<br>e 6c<br>=   | 271.36<br>Gains<br>W<br>80.40<br>10.90   | (73)<br>(79)<br>(75)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa  | 279.18<br>atts Σ(74)m  | 277.01  | 266.93<br>Access f<br>Table<br>0.7<br>0.7  | 251.11<br>actor<br>6d<br>7 x [<br>7 x [  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16   | 219.88<br>Sol<br>x 3<br>x 1   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 215.28<br>spec<br>or T<br>0.9 x   | <b>g</b><br>sific data<br>able 6b<br>0.63 x<br>0.63 x  | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70  | 257.79<br>data<br>e 6c<br>= ==  | 271.36<br>Gains<br>W<br>80.40<br>10.90   | (73)<br>(79)<br>(75)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa  | 279.18<br>atts Σ(74)m<br>91.30   | 277.01<br>(82)m<br>159.13   | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34  | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>297.80  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27   | 219.88<br>Sol.<br>X 3<br>X 1<br>352.22  | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x  | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59  | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46  | 257.79<br>data<br>e 6c<br>= [<br>= [<br>110.01  | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70   | (73)<br>(79)<br>(75)<br>(83)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa  | 279.18<br>atts Σ(74)m<br>91.30<br>ernal and so   | 277.01<br>(82)m<br>159.13<br>lar (73)m +  | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m   | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>297.80  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27   | 219.88<br>Sol<br>x 3<br>x 1<br>352.22   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25                                | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59  | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46  | 257.79<br>data<br>e 6c<br>= [<br>= [<br>110.01  | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>77.70  | (73)<br>(79)<br>(75)<br>(83)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte  | 279.18<br>atts Σ(74)m<br>91.30<br>ernal and so<br>370.47   | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14  | 266.93<br>Access f<br>Table<br>0.7<br>227.34<br>(83)m<br>494.27  | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>297.80<br>548.91  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61   | 219.88<br>Sol.<br>X 3<br>X 1<br>352.22<br>572.10  | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25<br>513.53                      | g<br>ific data<br>able 6b<br>0.63 ×<br>0.63 ×<br>251.59<br>475.10  | 239.50<br><b>FF</b><br><b>specific c</b><br><b>or Table</b><br>0.70<br>0.70<br>178.46<br>417.97                     | 257.79<br>data<br>e 6c<br>= [<br>110.01<br>367.80   | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>77.70<br>349.07  | (73)<br>(79)<br>(75)<br>(83)<br>(84)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte  | 279.18<br>atts Σ(74)m<br>91.30<br>ernal and so<br>370.47   | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14  | 266.93 Access f Table 0.7 0.7 227.34 (83)m 494.27  | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>297.80<br>548.91  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61   | 219.88<br>Sol<br>x 3<br>x 1<br>352.22<br>572.10   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25<br>513.53                      | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59<br>475.10  | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97  | 257.79<br>data<br>e 6c<br>= [<br>110.01<br>367.80   | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>77.70<br>349.07  | (73)<br>(79)<br>(75)<br>(83)<br>(84)   |
| <ol> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> </ol>   | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperat  | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heatin  | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>ng season)   | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>297.80<br>548.91  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61   | 219.88<br>Sol<br>x 3<br>x 1<br>352.22<br>572.10   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25<br>513.53                      | g         ific data         able 6b         0.63       ×         0.63       ×         251.59         475.10                    | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97  | 257.79  | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>77.70<br>349.07  | (73)<br>(79)<br>(75)<br>(83)<br>(84)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> </ul>   | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperat  | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heating periods in  | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>ng season)<br>the living a   | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>297.80<br>548.91<br>area from T   | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61   | 219.88<br>Sol<br>x 3<br>x 1<br>352.22<br>572.10   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25<br>513.53                      | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59<br>475.10  | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97  | 257.79<br>data<br>e 6c<br>= [<br>] = [<br>110.01<br>367.80                                    | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>21.00  | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> </ul>   | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperat<br>ring heating<br>Jan   | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heating<br>periods in<br>Feb  | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>ng season)<br>the living a<br>Mar  | 251.11<br>actor<br>6d<br>7 × [<br>7 × [<br>297.80<br>548.91<br>area from T<br>Apr  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61   | 219.88<br>Sol.<br>W<br>X 3<br>X 1<br>352.22<br>572.10   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25<br>513.53<br>Aug               | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59<br>475.10<br>Sep   | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>Oct                                   | 257.79<br>data<br>e 6c<br>= [<br>110.01<br>367.80<br>Nov                                      | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>21.00<br>Dec                                   | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>   | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>nal temperations<br>uring heating<br>Jan<br>r for gains for  | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heating<br>g periods in<br>Feb<br>or living are   | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>(83)m<br>494.27<br>the living a<br>Mar<br>ea n1,m (se  | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>297.80<br>548.91<br>area from T<br>Apr<br>e Table 9a)  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61   | 219.88<br>Sol<br>x 3<br>x 1<br>352.22<br>572.10   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90  | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25<br>513.53<br>Aug               | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59<br>475.10<br>Sep   | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>Oct                                   | 257.79<br>data<br>= 6c<br>= [<br>110.01<br>367.80<br>Nov                                      | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>349.07<br>21.00<br>Dec                         | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>   | 279.18<br>279.18<br>279.18<br>91.30<br>ernal and so<br>370.47<br>al temperator<br>ring heating<br>Jan<br>r for gains for<br>0.99   | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heating<br>periods in<br>Feb<br>or living are<br>0.99   | 266.93 Access f Table 0.7 0.7 0.7 227.34 (83)m 494.27 ng season) the living a Mar ea n1,m (se 0.97   | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>297.80<br>548.91<br>area from T<br>Apr<br>e Table 9a)<br>0.92  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61<br>Table 9, Th:<br>May  | 219.88<br>Sol.<br>W<br>X 3<br>X 1<br>352.22<br>572.10<br>1(°C)<br>Jun<br>0.64   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90<br>Jul<br>0.48                           | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25<br>513.53<br>Aug<br>0.53       | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59<br>475.10<br>Sep<br>0.77                                     | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>Oct<br>0.95                           | 257.79  | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>21.00<br>Dec<br>1.00                           | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal te</li> </ul>   | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperation<br>uring heating<br>Jan<br>r for gains for<br>0.99<br>emp of living   | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s  | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>(83)m<br>494.27<br>the living a<br>Mar<br>ea n1,m (se<br>0.97<br>teps 3 to 7   | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>297.80<br>548.91<br>area from T<br>Apr<br>e Table 9a)<br>0.92<br>in Table 9c   | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61<br>Fable 9, Th:<br>May<br>0.81<br>c)  | 219.88<br>Sol<br>x 3<br>x 1<br>352.22<br>572.10<br>1(°C)<br>Jun<br>0.64   | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90<br>546.90                                | 215.28<br>spec<br>or T<br>0.9 x<br>0.9 x<br>298.25<br>513.53<br>Aug<br>0.53       | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59<br>475.10<br>Sep<br>0.77                                     | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>Oct<br>0.95                           | 257.79<br>data<br>e 6c<br>= [<br>] = [<br>110.01<br>367.80<br>Nov<br>0.99                     | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>349.07<br>21.00<br>Dec<br>1.00                 | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal te</li> </ul>   | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperat<br>ring heating<br>Jan<br>r for gains fo<br>0.99<br>emp of living<br>19.76   | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heating<br>geriods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>19.95  | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>(83)m<br>494.27<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se<br>0.97<br>teps 3 to 7<br>20.23                                  | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>297.80<br>548.91<br>area from T<br>Apr<br>e Table 9a)<br>0.92<br>in Table 9c<br>20.57  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61<br>Table 9, Th:<br>May<br>0.81<br>c)<br>20.83                               | 219.88<br>Sol.<br>M<br>X 3<br>X 1<br>352.22<br>572.10<br>1(°C)<br>Jun<br>0.64<br>20.96                                | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90<br>Jul<br>0.48<br>20.99                  | 215.28 spec or T 0.9 x 0.9 x 298.25 513.53 Aug 0.53 20.99                         | 223.52<br>g<br>ific data<br>able 6b<br>0.63 ×<br>0.63 ×<br>251.59<br>475.10<br>Sep<br>0.77<br>20.90                            | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>Oct<br>0.95<br>20.56                  | 257.79<br>data<br>e 6c<br>= [<br>110.01<br>367.80<br>Nov<br>0.99<br>20.10                     | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>21.00<br>Dec<br>1.00<br>19.73                  | (73)<br>(79)<br>(75)<br>(83)<br>(84)<br>(85)<br>(85)<br>(86)<br>(87)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal te</li> <li>Temperature du</li> </ul>                                     | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperat<br>uring heating<br>Jan<br>r for gains fo<br>0.99<br>emp of living<br>19.76<br>iring heating                                   | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>19.95<br>g periods in                                   | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>(83)m<br>494.27<br>the living a<br>Mar<br>ea n1,m (se<br>0.97<br>teps 3 to 7<br>20.23<br>the rest of                                 | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>297.80<br>548.91<br>area from T<br>Apr<br>e Table 9a)<br>0.92<br>in Table 9c<br>20.57<br>f dwelling fi   | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61<br>Fable 9, Th:<br>May<br>0.81<br>c)<br>20.83<br>rom Table                  | 219.88<br>Sol<br>x 3<br>x 1<br>352.22<br>572.10<br>1(°C)<br>Jun<br>0.64<br>20.96<br>9, Th2(°C)                        | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90<br>Jul<br>0.48<br>20.99                  | 215.28 spec or T 0.9 x 0.9 x 298.25 513.53 Aug 0.53 20.99                         | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59<br>475.10<br>475.10<br>Sep<br>0.77<br>20.90                  | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>Oct<br>0.95<br>20.56                  | 257.79<br>data<br>e 6c<br>= [<br>] = [<br>] 110.01<br>367.80<br>Nov<br>Nov<br>0.99<br>20.10   | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>21.00<br>Dec<br>1.00<br>19.73                  | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> <li>(87)</li> </ul>   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal te</li> <li>Temperature du</li> </ul>                                     | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperat<br>ring heating<br>Jan<br>r for gains fo<br>0.99<br>emp of living<br>19.76<br>iring heating<br>19.88                           | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heating<br>geriods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>19.95<br>g periods in<br>19.89                           | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>ng season)<br>the living a<br>Mar<br>an 1,m (se<br>0.97<br>teps 3 to 7<br>20.23<br>the rest of<br>19.89                              | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>297.80<br>548.91<br>area from T<br>Apr<br>e Table 9a)<br>0.92<br>in Table 9c<br>20.57<br>dwelling fr<br>19.90  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61<br>Table 9, Th:<br>May<br>0.81<br>c)<br>20.83<br>rom Table<br>19.90         | 219.88<br>Sol.<br>W<br>X 3<br>X 1<br>352.22<br>572.10<br>1(°C)<br>Jun<br>0.64<br>20.96<br>9, Th2(°C)<br>19.91         | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90<br>Jul<br>0.48<br>20.99                  | 215.28 spec or T 0.9 x 0.9 x 298.25 513.53 Aug 0.53 20.99 19.91                   | 223.52<br>g<br>ific data<br>able 6b<br>0.63 ×<br>0.63 ×<br>251.59<br>475.10<br>Sep<br>0.77<br>20.90<br>19.91                   | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>Oct<br>0.95<br>20.56<br>19.90         | 257.79<br>data<br>e 6c<br>= [<br>] = [<br>] 110.01<br>367.80<br>Nov<br>0.99<br>20.10<br>19.90 | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>21.00<br>Dec<br>1.00<br>19.73                  | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> <li>(87)</li> <li>(88)</li> </ul>               |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in was</li> <li>Total gains - intern</li> <li>Total gains - intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal te</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul> | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperator<br>ring heating<br>Jan<br>r for gains for<br>0.99<br>emp of living<br>19.76<br>iring heating<br>19.88<br>r for gains for     | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>19.95<br>g periods in<br>19.89<br>or rest of do         | 266.93<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>227.34<br>(83)m<br>494.27<br>(83)m<br>494.27<br>the living a<br>Mar<br>ea n1,m (se<br>0.97<br>teps 3 to 7<br>20.23<br>the rest of<br>19.89<br>welling n2,i | 251.11<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>297.80<br>548.91<br>area from T<br>Apr<br>e Table 9a)<br>0.92<br>in Table 9a<br>0.92<br>in Table 9a<br>0.92<br>in Table 9a<br>0.92<br>in Table 9a<br>0.92<br>in Table 9a<br>0.92<br>in Table 9a<br>0.92<br>in Table 9a | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61<br>Fable 9, Th:<br>May<br>0.81<br>c)<br>20.83<br>rom Table<br>19.90         | 219.88<br>Sol<br>x 3<br>x 1<br>352.22<br>572.10<br>1(°C)<br>Jun<br>0.64<br>20.96<br>9, Th2(°C)<br>19.91               | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90<br>Jul<br>0.48<br>20.99<br>19.91         | 215.28 <pre>spec or T 0.9 x 0.9 x 298.25 298.25 513.53 Aug 0.53 20.99 19.91</pre> | 223.52<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>251.59<br>475.10<br>475.10<br>Sep<br>0.77<br>20.90<br>19.91         | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>0ct<br>0.95<br>20.56<br>19.90         | 257.79<br>data<br>6c<br>= [<br>] = [<br>110.01<br>367.80<br>Nov<br>0.99<br>20.10<br>19.90     | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>77.70<br>349.07<br>21.00<br>Dec<br>1.00<br>19.73<br>19.89          | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> <li>(87)</li> <li>(88)</li> </ul>               |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal te</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>         | 279.18<br>atts $\Sigma(74)$ m<br>91.30<br>ernal and so<br>370.47<br>al temperat<br>ring heating<br>Jan<br>r for gains fo<br>0.99<br>emp of living<br>19.76<br>iring heating<br>19.88<br>r for gains fo<br>0.99 | 277.01<br>(82)m<br>159.13<br>lar (73)m +<br>436.14<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>19.95<br>g periods in<br>19.89<br>or rest of do<br>0.98 | 266.93<br>Access f<br>Table<br>0.77<br>0.77<br>227.34<br>(83)m<br>494.27<br>ng season)<br>the living a<br>Mar<br>ea n1,m (see<br>0.97<br>teps 3 to 7<br>20.23<br>the rest of<br>19.89<br>welling n2,0<br>0.96  | 251.11<br>actor<br>6d<br>7 × [<br>7 × [<br>7 × [<br>7 × [<br>297.80<br>548.91<br>area from T<br>Apr<br>e Table 9a)<br>0.92<br>in Table 9c<br>20.57<br>dwelling fr<br>19.90<br>m<br>0.90  | 235.34<br>Area<br>m <sup>2</sup><br>7.15<br>3.16<br>348.27<br>583.61<br>583.61<br>Table 9, Th:<br>May<br>0.81<br>c)<br>20.83<br>rom Table<br>19.90<br>0.76 | 219.88<br>Sol.<br>M<br>x 3<br>x 1<br>352.22<br>572.10<br>1(°C)<br>Jun<br>0.64<br>20.96<br>9, Th2(°C)<br>19.91<br>0.54 | 210.01<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>336.89<br>546.90<br>Jul<br>0.48<br>20.99<br>19.91<br>0.36 | 215.28 spec or T 0.9 x 0.9 x 298.25 513.53 Aug 0.53 20.99 19.91 0.41              | 223.52<br>g<br>ific data<br>able 6b<br>0.63 ×<br>0.63 ×<br>0.63 ×<br>251.59<br>475.10<br>5ep<br>0.77<br>20.90<br>19.91<br>0.68 | 239.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>178.46<br>417.97<br>Oct<br>0.95<br>20.56<br>19.90<br>0.93 | 257.79<br>data<br>e 6c<br>= [<br>110.01<br>367.80<br>Nov<br>0.99<br>20.10<br>19.90<br>0.99    | 271.36<br>Gains<br>W<br>80.40<br>10.90<br>777.70<br>349.07<br>21.00<br>Dec<br>1.00<br>19.73<br>19.89<br>0.99 | <ul> <li>(73)</li> <li>(79)</li> <li>(75)</li> <li>(83)</li> <li>(84)</li> <li>(84)</li> <li>(85)</li> <li>(86)</li> <li>(87)</li> <li>(88)</li> <li>(89)</li> </ul> |

| Mean internal to   | emperature    | in the rest       | of dwelling | g T2 (follow      | steps 3 to   | 7 in Table 9 | Əc)    |         |              |               |        |         |                  |
|--------------------|---------------|-------------------|-------------|-------------------|--------------|--------------|--------|---------|--------------|---------------|--------|---------|------------------|
|                    | 18.26         | 18.53             | 18.94       | 19.42             | 19.75        | 19.89        | 19.91  | 19.91   | 19.84        | 19.41         | 18.75  | 18.22   | (90)             |
| Living area fract  | ion           |                   |             |                   |              |              |        |         | Liv          | ving area ÷   | (4) =  | 0.50    | (91)             |
| Mean internal to   | emperature    | for the wh        | ole dwellin | g fLA x T1 +      | +(1 - fLA) x | Т2           |        |         |              |               |        |         |                  |
|                    | 19.00         | 19.24             | 19.58       | 19.99             | 20.28        | 20.42        | 20.45  | 20.44   | 20.37        | 19.98         | 19.42  | 18.97   | (92)             |
| Apply adjustme     | nt to the me  | ean interna       | l temperati | ure from Ta       | able 4e whe  | ere appropr  | iate   |         |              |               |        |         |                  |
|                    | 19.00         | 19.24             | 19.58       | 19.99             | 20.28        | 20.42        | 20.45  | 20.44   | 20.37        | 19.98         | 19.42  | 18.97   | (93)             |
| 8 Snace heatin     | ng requirem   | ont               |             |                   |              |              |        |         |              |               |        |         |                  |
| o. space neath     | lan           | Eeb               | Mar         | Apr               | May          | lun          | iul    | Δυσ     | Sen          | Oct           | Nov    | Dec     |                  |
| Utilisation facto  | r for gains   | nm i eb           | IVIAI       | Арі               | Ividy        | Jun          | 501    | Aug     | Зер          | 000           | NOV    | Dec     |                  |
|                    |               |                   | 0.06        | 0.00              | 0.79         | 0.50         | 0.42   | 0.47    | 0.72         | 0.02          | 0.08   | 0.00    | (04)             |
| Useful gains nr    | 0.99          | 0.90              | 0.90        | 0.90              | 0.78         | 0.59         | 0.42   | 0.47    | 0.72         | 0.95          | 0.98   | 0.99    | ] (94)           |
|                    | 367.32        | 128 27            | 474.30      | 101 51            | 151 31       | 227.01       | 229.54 | 239.61  | 343.64       | 287.88        | 361 54 | 346.76  | (05)             |
| Monthly averag     | e external t  | emperatur         | e from Tabl | 494.31<br>۵     1 | 434.34       | 557.01       | 229.34 | 239.01  | 545.04       | 387.88        | 501.54 | 540.70  | ] (93)           |
| wontiny averag     |               | 4 90              | 6 50        | 8 90              | 11 70        | 14.60        | 16.60  | 16.40   | 14.10        | 10.60         | 7 10   | 4.20    | (96)             |
| Heat loss rate fo  | r mean inte   | ernal temp        | erature Im  | W [(39)m          | 11.70        | (96)ml       | 10.00  | 10.40   | 14.10        | 10.00         | 7.10   | 4.20    | ] (30)           |
|                    | 912.38        | 887.31            | 807.35      | 676.40            | 522.45       | 350.54       | 231.66 | 2/13 09 | 378.96       | 571.04        | 753.24 | 907.09  | (97)             |
| Snace heating re   | equirement    | kWh/mor           | 1007.33     | [(97)m - (9       | 5)ml x (41)  | m            | 251.00 | 243.05  | 576.50       | 571.04        | 755.24 | 507.05  |                  |
|                    | 405 53        | 308.48            | 247 79      | 130.96            | 50.68        | 0.00         | 0.00   | 0.00    | 0.00         | 136.27        | 282.02 | 416.88  | 1                |
|                    | 403.33        | 500.40            | 247.75      | 150.50            | 50.00        | 0.00         | 0.00   | 0.00    | 0.00<br>۲/۵۹ | 130.27        | 12 -   | 1978 60 | ]<br>] (98)      |
| Snace heating r    | auirement     | $kWh/m^2/v$       | ear         |                   |              |              |        |         | 2(50         | (98)          | .12    | 39.73   | ] (90)<br>] (99) |
|                    | equirement    | K V V II / II / Y | cai         |                   |              |              |        |         |              | (90)          | . (4)  | 33.73   | ] (33)           |
| 9a. Energy req     | uirements -   | individual        | heating sy  | stems inclu       | iding micro  | -CHP         |        |         |              |               |        |         |                  |
| Space heating      |               |                   |             |                   |              |              |        |         |              |               |        |         |                  |
| Fraction of spac   | e heat from   | secondary         | /suppleme   | ntary syste       | m (table 11  | L)           |        |         |              |               |        | 0.00    | (201)            |
| Fraction of spac   | e heat from   | main syste        | em(s)       |                   |              |              |        |         |              | 1 - (2        | 01) =  | 1.00    | (202)            |
| Fraction of spac   | e heat from   | main syste        | em 2        |                   |              |              |        |         |              |               |        | 0.00    | (202)            |
| Fraction of total  | space heat    | from main         | system 1    |                   |              |              |        |         | (20          | 02) x [1- (20 | 3)] =  | 1.00    | (204)            |
| Fraction of total  | space heat    | from main         | system 2    |                   |              |              |        |         |              | (202) x (20   | 03) =  | 0.00    | (205)            |
| Efficiency of ma   | in system 1   | (%)               |             |                   |              |              |        |         |              |               |        | 93.40   | (206)            |
|                    | Jan           | Feb               | Mar         | Apr               | May          | Jun          | Jul    | Aug     | Sep          | Oct           | Nov    | Dec     |                  |
| Space heating fu   | uel (main sy  | stem 1), kV       | Vh/month    |                   |              |              |        |         |              |               |        |         |                  |
|                    | 434.18        | 330.27            | 265.30      | 140.21            | 54.26        | 0.00         | 0.00   | 0.00    | 0.00         | 145.90        | 301.95 | 446.34  |                  |
|                    |               |                   |             |                   |              |              |        |         | ∑(212        | 1)15, 10      | .12 =  | 2118.42 | (211)            |
| Water heating      |               |                   |             |                   |              |              |        |         |              |               |        |         |                  |
| Efficiency of wa   | ter heater    |                   |             |                   |              |              |        |         |              |               |        |         |                  |
|                    | 87.26         | 86.95             | 86.34       | 85.05             | 82.94        | 80.30        | 80.30  | 80.30   | 80.30        | 85.03         | 86.67  | 87.37   | (217)            |
| Water heating f    | uel, kWh/m    | onth              |             |                   |              |              |        |         |              |               |        |         |                  |
|                    | 186.38        | 163.38            | 171.19      | 154.15            | 153.03       | 139.22       | 133.38 | 148.69  | 150.33       | 161.66        | 169.30 | 181.77  |                  |
|                    |               |                   |             |                   |              |              |        |         |              | ∑(219a)1      | .12 =  | 1912.47 | (219)            |
| Annual totals      |               |                   |             |                   |              |              |        |         |              |               |        |         |                  |
| Space heating fu   | uel - main sy | stem 1            |             |                   |              |              |        |         |              |               |        | 2118.42 |                  |
| Water heating f    | uel           |                   |             |                   |              |              |        |         |              |               |        | 1912.47 |                  |
| Electricity for pu | imps, fans a  | nd electric       | keep-hot (  | Table 4f)         |              |              |        |         |              | _             |        |         |                  |
| central heati      | ng pump or    | water pun         | np within w | arm air hea       | ating unit   |              |        |         | 30.00        |               |        |         | (230c)           |
| boiler flue fa     | n             |                   |             |                   |              |              |        |         | 45.00        | ]             | _      |         | (230e)           |
| Total electricity  | for the abo   | ve, kWh/ve        | ear         |                   |              |              |        |         |              |               |        | 75.00   | (231)            |

10a. Fuel costs - individual heating systems including micro-CHP

(232) (238)

|   | Fuel       |   | Fuel price      |                 | Fuel         |       |
|---|------------|---|-----------------|-----------------|--------------|-------|
|   | kvvii/yeai |   |                 |                 | cost £/ year | -     |
| Space heating - main system 1   | 2118.42    | х | 3.48            | x 0.01 =        | 73.72        | (240) |
| Water heating   | 1912.47    | х | 3.48            | x 0.01 =        | 66.55        | (247) |
| Pumps and fans  | 75.00      | x | 13.19           | x 0.01 =        | 9.89         | (249) |
| Electricity for lighting  | 231.87     | х | 13.19           | x 0.01 =        | 30.58        | (250) |
| Additional standing charges   |            |   |                 |                 | 120.00       | (251) |
| Total energy cost   |            |   | (240)(242) +    | (245)(254) =    | 300.75       | (255) |
| 11a. SAP rating - individual heating systems including micro-CH             | IP         |   |                 |                 |              |       |
| Energy cost deflator (Table 12)   |            |   |                 |                 | 0.42         | (256) |
| Energy cost factor (ECF)  |            |   |                 |                 | 1.33         | (257) |
| SAP value   |            |   |                 |                 | 81.41        | ]     |
| SAP rating (section 13)   |            |   |                 |                 | 81           | (258) |
| SAP band  |            |   |                 |                 | В            | ]     |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro | D-CHP      |   |                 |                 |              |       |
|   | Energy     |   | Emission factor |                 | Emissions    |       |
|   | kWh/year   |   | kg CO₂/kWh      |                 | kg CO₂/year  |       |
| Space heating - main system 1   | 2118.42    | x | 0.22            | =               | 457.58       | (261) |
| Water heating   | 1912.47    | x | 0.22            | =               | 413.09       | (264) |
| Space and water heating   |            |   | (261) + (262) + | (263) + (264) = | 870.67       | (265) |
| Pumps and fans  | 75.00      | x | 0.52            | =               | 38.93        | (267) |
| Electricity for lighting  | 231.87     | x | 0.52            | =               | 120.34       | (268) |
| Total CO <sub>2</sub> , kg/year   |            |   |                 | (265)(271) =    | 1029.94      | (272) |
| Dwelling CO₂ emission rate  |            |   |                 | (272) ÷ (4) =   | 20.68        | (273) |
| El value  |            |   |                 |                 | 85.44        | ]     |
| El rating (section 14)  |            |   |                 |                 | 85           | (274) |

EI band

| 12a Drimary  | energy - individur | al heating syst | oms includin  | a micro-CHD |
|--------------|--------------------|-----------------|---------------|-------------|
| 15d. Prindry | energy - murviuu   | ai neating syst | enis includin | е ппсто-сп  |

|  | Energy<br>kWh/year |   | Primary factor  |                 | Primary Energy<br>kWh/year |       |
|--|--------------------|---|-----------------|-----------------|----------------------------|-------|
| Space heating - main system 1            | 2118.42            | х | 1.22            | =               | 2584.47                    | (261) |
| Water heating                            | 1912.47            | х | 1.22            | =               | 2333.21                    | (264) |
| Space and water heating                  |                    |   | (261) + (262) + | (263) + (264) = | 4917.68                    | (265) |
| Pumps and fans                           | 75.00              | х | 3.07            | =               | 230.25                     | (267) |
| Electricity for lighting                 | 231.87             | х | 3.07            | =               | 711.86                     | (268) |
| Primary energy kWh/year                  |                    |   |                 |                 | 5859.78                    | (272) |
| Dwelling primary energy rate kWh/m2/year |                    |   |                 |                 | 117.67                     | (273) |

В



| Assessor name                | Mr John        | Simpson       |               |               |               |                |          | Assessor nun                | nber           | 3722   |                   |       |
|------------------------------|----------------|---------------|---------------|---------------|---------------|----------------|----------|-----------------------------|----------------|--------|-------------------|-------|
| Client                       |                |               |               |               |               |                |          | Last modified               | t              | 19/11, | /2014             |       |
| Address                      | Unit 2.04      | Marine Ice    | es Haversto   | ck Hill, Lor  | ndon, NW3     | 2BL            |          |                             |                |        |                   |       |
|                              |                |               |               |               |               |                |          |                             |                |        |                   |       |
| 1. Overall dwelling dime     | nsions         |               |               |               |               |                |          |                             |                |        |                   |       |
|                              |                |               |               | Δ             | area (m²)     |                | А        | verage storey<br>height (m) | ,              | Vo     | lume (m³)         |       |
| Lowest occupied              |                |               |               |               | 69.20         | (1a) x         |          | 2.60                        | ] (2a) =       |        | 179.92            | (3a)  |
| Total floor area             | (1a)           | + (1b) + (1   | c) + (1d)(    | Ln) =         | 69.20         | (4)            |          |                             |                |        |                   |       |
| Dwelling volume              |                |               |               |               |               |                | (        | 3a) + (3b) + (3             | 3c) + (3d)(3   | n) =   | 179.92            | (5)   |
| 2. Ventilation rate          |                |               |               |               |               |                |          |                             |                |        |                   |       |
|                              |                |               |               |               |               |                |          |                             |                | m³     | ' per hour        |       |
| Number of chimneys           |                |               |               |               |               |                |          | 0                           | x 40 =         |        | 0                 | (6a)  |
| Number of open flues         |                |               |               |               |               |                |          | 0                           | x 20 =         |        | 0                 | (6b)  |
| Number of intermittent fa    | ns             |               |               |               |               |                |          | 2                           | x 10 =         |        | 20                | (7a)  |
| Number of passive vents      |                |               |               |               |               |                |          | 0                           | x 10 =         |        | 0                 | (7b)  |
| Number of flueless gas fire  | es             |               |               |               |               |                |          | 0                           | x 40 =         |        | 0                 | (7c)  |
|                              |                |               |               |               |               |                |          |                             |                | Air c  | hanges pe<br>hour | r     |
| Infiltration due to chimner  | ys, flues, fan | s, PSVs       |               | (6a)          | ) + (6b) + (7 | 'a) + (7b) + ( | (7c) =   | 20                          | ÷ (5) =        |        | 0.11              | (8)   |
| If a pressurisation test has | been carrie    | d out or is i | ntended, pi   | oceed to (    | 17), otherv   | vise continu   | e from ( | 9) to (16)                  |                |        |                   |       |
| Air permeability value, q5   | 0, expressed   | in cubic m    | etres per h   | our per squ   | uare metre    | of envelop     | e area   |                             |                |        | 5.00              | (17)  |
| If based on air permeabilit  | y value, the   | n (18) = [(1  | 7) ÷ 20] + (8 | s), otherwi   | se (18) = (1  | .6)            |          |                             |                |        | 0.36              | (18)  |
| Number of sides on which     | the dwelling   | g is sheltere | ed            |               |               |                |          |                             |                |        | 2                 | (19)  |
| Shelter factor               |                |               |               |               |               |                |          | 1                           | - [0.075 x (19 | 9)] =  | 0.85              | (20)  |
| Infiltration rate incorporat | ing shelter f  | actor         |               |               |               |                |          |                             | (18) x (2      | 0) =   | 0.31              | (21)  |
| Infiltration rate modified f | or monthly     | wind speed    | :             |               |               |                |          |                             |                |        |                   |       |
| Jan                          | Feb            | Mar           | Apr           | May           | Jun           | Jul            | Aug      | Sep                         | Oct            | Nov    | Dec               |       |
| Monthly average wind spe     | ed from Tak    | ole U2        |               |               |               |                |          |                             |                |        |                   |       |
| 5.10                         | 5.00           | 4.90          | 4.40          | 4.30          | 3.80          | 3.80           | 3.70     | 4.00                        | 4.30           | 4.50   | 4.70              | (22)  |
| Wind factor (22)m ÷ 4        |                |               |               |               |               |                |          |                             |                |        |                   |       |
| 1.28                         | 1.25           | 1.23          | 1.10          | 1.08          | 0.95          | 0.95           | 0.93     | 1.00                        | 1.08           | 1.13   | 1.18              | (22a) |
| Adjusted infiltration rate ( | allowing for   | shelter and   | l wind facto  | or) (21) x (2 | 22a)m         |                | _        |                             |                |        |                   | _     |
| 0.39                         | 0.38           | 0.38          | 0.34          | 0.33          | 0.29          | 0.29           | 0.28     | 0.31                        | 0.33           | 0.35   | 0.36              | (22b) |
| Calculate effective air cha  | nge rate for   | the applica   | ble case:     |               |               |                |          |                             |                |        |                   | _     |
| If mechanical ventilation    | on: air chang  | e rate thro   | ugh system    |               |               |                |          |                             |                |        | N/A               | (23a) |
| If balanced with heat r      | ecovery: effi  | ciency in %   | allowing fo   | or in-use fa  | ctor from T   | Fable 4h       |          |                             |                |        | N/A               | (23c) |
| d) natural ventilation c     | r whole hou    | se positive   | input venti   | lation fron   | n loft        | -1             |          |                             |                |        |                   | _     |
| 0.58                         | 0.57           | 0.57          | 0.56          | 0.55          | 0.54          | 0.54           | 0.54     | 0.55                        | 0.55           | 0.56   | 0.57              | (24d) |
| Effective air change rate -  | enter (24a) (  | or (24b) or   | (24c) or (24  | d) in (25)    | 1             | 1              |          |                             | · · · ·        |        |                   | _     |
| 0.58                         | 0.57           | 0.57          | 0.56          | 0.55          | 0.54          | 0.54           | 0.54     | 0.55                        | 0.55           | 0.56   | 0.57              | (25)  |



| <b>5.</b> Heat 1033es a  |   | · ·  |   |  |   |   |  |   |   |  |  |   |  |
|--|---|--|---|--|---|---|--|---|---|--|--|---|--|
| Element  |   |  | а   | Gross<br>rea, m²   | Openings<br>m <sup>2</sup>  | Net a<br>A, r   | irea<br>n²   | U-value<br>W/m²K  | A x U V   | V/К к-v<br>kJ  | value,<br>/m².K  | Ахк,<br>kJ/K  |  |
| Window   |   |  |   |  |   | 15.3  | 16 x   | 1.33  | = 20.10   | D  |  |   | (27)   |
| Door   |   |  |   |  |   | 2.1   | .4 x   | 1.00  | = 2.14  |  |  |   | (26)   |
| External wall  |   |  |   |  |   | 47.4  | 42 X   | 0.18  | = 8.54  |  |  |   | (29a)  |
| Party wall   |   |  |   |  |   | 30.5  | 52 X   | 0.00  | = 0.00  | <u> </u>   |  |   | (32)   |
| Total area of ext  | ernal eleme   | ents ∑A, m <sup>2</sup>  | 2   |  |   | 64.   | 72   |   |   |  |  |   | (31)   |
| Fabric heat loss,  | W/K = ∑(A   | × U)   |   |  |   |   |  |   | (2  | 6)(30) + (   | 32) =  | 30.77   | (33)   |
| Heat capacity Cr   | m = ∑(А x к)  |  |   |  |   |   |  | (28)  | .(30) + (32)  | + (32a)(3  | 2e) =  | N/A   | (34)   |
| Thermal mass pa  | arameter (T   | ·MP) in kJ/r   | m²K   |  |   |   |  |   |   |  |  | 250.00  | (35)   |
| Thermal bridges  | : Σ(L x Ψ) ca   | alculated us   | sing Appen  | dix K  |   |   |  |   |   |  |  | 6.39  | (36)   |
| Total fabric heat  | : loss  |  | 0 11  |  |   |   |  |   |   | (33) + (   | 36) =  | 37.17   | (37)   |
|  | Jan   | Feb  | Mar   | Apr  | May   | Jun   | Jul  | Aug   | Sep   | Oct  | Nov  | Dec   |  |
| Ventilation heat   | loss calcula  | ited month   | nly 0.33 x (2   | 25)m x (5)   | -   |   |  |   |   |  |  |   |  |
|  | 34.23   | 34.06  | 33.89   | 33.07  | 32.92   | 32.21   | 32.21  | 32.08   | 32.48   | 32.92  | 33.23  | 33.55   | (38)   |
| Heat transfer co   | efficient, W  | י<br>//K (37)m⊣  | + (38)m   |  | 1   |   |  | I   |   |  |  |   |  |
|  | 71.40   | 71.22  | 71.05   | 70.24  | 70.09   | 69.38   | 69.38  | 69.25   | 69.65   | 70.09  | 70.39  | 70.72   | 7  |
|  |   |  |   |  |   |   |  |   | Average =   | Σ(39)112   | /12 =  | 70.24   | _<br>] (39)  |
| Heat loss param  | eter (HLP),   | W/m²K (39  | 9)m ÷ (4)   |  |   |   |  |   | U   |  |  |   |  |
|  | 1.03  | 1.03   | 1.03  | 1.01   | 1.01  | 1.00  | 1.00   | 1.00  | 1.01  | 1.01   | 1.02   | 1.02  | 7  |
|  |   |  |   |  |   |   |  |   | Average =   | $\Sigma(40)112$  | /12 =  | 1.01  | <br>(40)   |
| Number of days   | in month (1   | Fable 1a)  |   |  |   |   |  |   | , a cruge   | 2(10)211122,   |  | 1.01  |  |
|  | 31.00   | 28.00  | 31.00   | 30.00  | 31.00   | 30.00   | 31.00  | 31.00   | 30.00   | 31.00  | 30.00  | 31.00   | (40)   |
|  |   |  |   |  |   |   |  |   |   |  |  |   | 1  |
|  |   |  |   |  |   |   |  |   |   |  |  |   |  |
| 4. Water heating   | ng energy r   | equiremen  | nt  |  |   |   |  |   |   |  |  |   |  |
| 4. Water heatin<br>Assumed occupa  | ng energy r<br>ancy, N  | equiremen  | ıt  |  |   |   |  |   |   |  |  | 2.23  | (42)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average  | ng energy r<br>ancy, N<br>hot water u   | equiremen<br>Isage in litr   | it<br>es per day '  | Vd,average   | = (25 x N) +  | 36  |  |   |   |  |  | 2.23<br>87.08   | _ (42)<br>_ (43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average  | ng energy r<br>ancy, N<br>hot water u<br>Jan  | equiremen<br>Isage in litr<br>Feb  | it<br>es per day<br>Mar   | Vd,average<br><b>Apr</b>   | = (25 x N) +<br>May   | 36<br>Jun   | lut  | Aug   | Sep   | Oct  | Nov  | 2.23<br>87.08<br>Dec  | ] (42)<br>] (43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe  | equiremen<br>Isage in litr<br><b>Feb</b><br>r day for ea   | es per day '<br>Mar<br>ach month  | Vd,average<br><b>Apr</b><br>Vd,m = fact  | = (25 x N) +<br><b>May</b><br>tor from Tabl   | 36<br>Jun<br>le 1c x (43)   | Jul  | Aug   | Sep   | Oct  | Nov  | 2.23<br>87.08<br>Dec  | _ (42)<br>_ (43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>: in litres pe<br>95.79   | equiremen<br>Isage in litr<br><b>Feb</b><br>r day for ea<br>92.31  | es per day '<br>Mar<br>ach month<br>88.82   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34   | = (25 x N) +<br><b>May</b><br>tor from Tabl<br>81.86  | 36<br>Jun<br>le 1c x (43)<br>78.37  | Jul<br>78.37   | Aug<br>81.86  | Sep<br>85.34  | Oct<br>88.82   | Nov  | 2.23<br>87.08<br><b>Dec</b><br>95.79  | ] (42)<br>] (43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79   | equiremen<br>Isage in litr<br>Feb<br>r day for ea<br>92.31   | es per day<br>Mar<br>ach month<br>88.82   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34   | = (25 x N) +<br><b>May</b><br>tor from Tabl<br>81.86  | 36<br>Jun<br>le 1c x (43)<br>78.37  | Jul<br>78.37   | Aug<br>81.86  | Sep<br>85.34  | <b>Oct</b><br>88.82<br>Σ(44)1  | Nov<br>92.31<br>.12 =  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97  | ) (42)<br>) (43)<br>) (44)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of  | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate  | equiremen<br>Isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:   | nt<br>es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34   | = (25 x N) +<br><b>May</b><br>tor from Tabl<br>81.86<br>8600 kWh/m  | 36<br>Jun<br>le 1c x (43)<br>78.37<br>onth (see 1   | Jul<br>78.37<br>Fables 1b,   | Aug<br>81.86<br>1c 1d)  | Sep<br>85.34  | <b>Oct</b><br>88.82<br>Σ(44)1  | Nov<br>92.31<br>.12 =  | 2.23<br>87.08<br><b>Dec</b><br>95.79<br>1044.97   | ) (42)<br>) (43)<br>) (44)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content o   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>in litres pe<br>95.79<br>of hot wate<br>142.05  | equiremen<br>Isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.1<br>124.24   | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>: nm x Tm/3<br>111.77  | = (25 x N) +<br><b>May</b><br>tor from Tabl<br>81.86<br>3600 kWh/m<br>107.25  | 36<br>Jun<br>le 1c x (43)<br>78.37<br>onth (see 7<br>92.55  | Jul<br>78.37<br>Fables 1b,<br>85.76  | Aug<br>81.86<br>1c 1d)<br>98.41   | Sep<br>85.34<br>99.58   | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05  | Nov<br>92.31<br>.12 =<br>126.68  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97  | ) (42)<br>) (43)<br>) (44)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content o   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05  | equiremen<br>Isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.1<br>124.24   | nt<br>es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>: nm x Tm/3<br>111.77  | = (25 x N) +<br>May<br>tor from Tabl<br>81.86<br>3600 kWh/m<br>107.25   | 36<br>Jun<br>le 1c x (43)<br>78.37<br>onth (see 7<br>92.55  | Jul<br>78.37<br>Tables 1b,<br>85.76  | Aug<br>81.86<br>1c 1d)<br>98.41   | Sep<br>85.34<br>99.58   | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =   | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>137.57<br>1370.12   | ) (42)<br>) (43)<br>) (44)<br>) (45)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>in litres pe<br>95.79<br>of hot wate<br>142.05  | equiremen<br>Isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.3<br>124.24   | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>: nm x Tm/3<br>111.77  | e = (25 x N) +<br>May<br>tor from Tabl<br>81.86<br>8600 kWh/m<br>107.25   | 36<br>Jun<br>le 1c x (43)<br>78.37<br>onth (see<br>92.55  | Jul<br>78.37<br>Fables 1b,<br>85.76  | Aug<br>81.86<br>1c 1d)<br>98.41   | Sep<br>85.34<br>99.58   | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =   | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12   | ) (42)<br>(43)<br>(44)<br>(44)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>4 0.15 x (45)<br>21.31  | equiremen<br>Isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>)m<br>18.64  | nt<br>es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77  | = (25 x N) +<br><b>May</b><br>tor from Tabl<br>81.86<br>3600 kWh/m<br>107.25<br>16.09   | 36<br>Jun<br>78.37<br>0nth (see 7<br>92.55  | Jul<br>78.37<br>Fables 1b,<br>85.76  | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76  | Sep<br>85.34<br>99.58<br>14.94  | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>137.57<br>1370.12<br>20.64                                  | ) (42)<br>(43)<br>(43)<br>(44)<br>(45)<br>(45)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage lo   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>in litres pe<br>95.79<br>of hot wate<br>142.05<br>c 0.15 x (45)<br>21.31<br>oss calculate   | equiremen<br>Isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.3<br>124.24<br>)m<br>18.64<br>ed for each   | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>month (55  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>111.77<br>16.77<br>5) x (41)m  | e = (25 x N) +<br>May<br>tor from Tabl<br>81.86<br>8600 kWh/m<br>107.25<br>16.09  | 36<br>Jun<br>le 1c x (43)<br>78.37<br>0nth (see<br>92.55<br>13.88   | Jul<br>78.37<br>Fables 1b,<br>85.76<br>12.86   | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76  | Sep<br>85.34<br>99.58<br>14.94  | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64  | ) (42)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage lo   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>4 0.15 x (45)<br>21.31<br>oss calculate<br>0.00   | equiremen<br>isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>)m<br>18.64<br>ed for each<br>0.00   | nt<br>es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>month (55<br>0.00  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00  | = (25 x N) +<br>May<br>tor from Tabl<br>81.86<br>3600 kWh/m<br>107.25<br>16.09<br>0.00  | 36<br>Jun<br>le 1c x (43)<br>78.37<br>onth (see 1<br>92.55<br>13.88   | Jul<br>78.37<br>Fables 1b,<br>85.76<br>12.86<br>0.00   | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76  | Sep<br>85.34<br>99.58<br>14.94<br>0.00  | <b>Oct</b><br><u>88.82</u><br>Σ(44)1<br><u>116.05</u><br>Σ(45)1<br><u>17.41</u><br>0.00  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64  | ) (42)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage loo  | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>in litres pe<br>95.79<br>of hot wate<br>142.05<br>0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>tains dedica   | equiremen<br>Isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.<br>124.24<br>)m<br>18.64<br>ed for each<br>0.00<br>ated solar s  | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>month (5!<br>0.00<br>ctorage or c  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>: nm x Tm/3<br>111.77<br>16.77<br>16.77<br>5) x (41)m<br>0.00<br>ledicated W                                     | <ul> <li>= (25 x N) +</li> <li>May</li> <li>tor from Tabl</li> <li>81.86</li> <li>3600 kWh/m</li> <li>107.25</li> <li>16.09</li> <li>16.09</li> <li>0.00</li> <li>VWHRS (56)n</li> </ul>  | 36<br>Jun<br>le 1c x (43)<br>78.37<br>0nth (see 7<br>92.55<br>13.88<br>13.88<br>0.00<br>n x [(47) - V                               | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>/s] ÷ (47),  | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)   | Sep<br>85.34<br>99.58<br>14.94<br>0.00  | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00                                    | ) (42)<br>(43)<br>(43)<br>(44)<br>(45)<br>(45)<br>(46)<br>(56)                                 |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage loo<br>If the vessel con   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>4 0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>tains dedica<br>0.00   | equiremen<br>isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>m<br>18.64<br>ed for each<br>0.00<br>ated solar s<br>0.00  | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>month (55<br>0.00<br>storage or c<br>0.00  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00                                       | = (25 x N) +<br>May<br>tor from Tabl<br>81.86<br>3600 kWh/m<br>107.25<br>16.09<br>0.00<br>VWHRS (56)n<br>0.00   | 36<br>Jun<br>le 1c x (43)<br>78.37<br>0nth (see 1<br>92.55<br>13.88<br>0.00<br>n x [(47) - \<br>0.00                                | Jul<br>78.37<br>Fables 1b,<br>85.76<br>12.86<br>0.00<br>/s] ÷ (47),<br>0.00  | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00   | Sep<br>85.34<br>99.58<br>14.94<br>0.00  | <b>Oct</b><br><u>88.82</u><br>Σ(44)1<br><u>116.05</u><br>Σ(45)1<br><u>17.41</u><br>0.00  | 92.31           .12 =           126.68           .12 =           19.00           0.00                                | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00                            | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)                         |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage loo<br>If the vessel con<br>Primary circuit lo   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>tains dedica<br>0.00<br>oss for each   | equiremen<br>isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>m<br>18.64<br>ed for each<br>0.00<br>ated solar s<br>0.00  | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>month (5!<br>0.00<br>ctorage or c<br>0.00<br>om Table 3  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77<br>16.77<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00                              | <ul> <li>= (25 x N) + May</li> <li>tor from Table</li> <li>81.86</li> <li>3600 kWh/m</li> <li>107.25</li> <li>16.09</li> <li>16.09</li> <li>0.00</li> <li>VWHRS (56)n</li> <li>0.00</li> </ul>  | 36<br>Jun<br>le 1c x (43)<br>78.37<br>92.55<br>13.88<br>0.00<br>n x [(47) - V<br>0.00   | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>12.86<br>(0.00<br>/s] ÷ (47),<br>0.00                                | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00   | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00  | Oct<br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00<br>0.00  | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00                            | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(56)                         |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage loo<br>If the vessel con<br>Primary circuit lo   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>c 0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>tains dedica<br>0.00<br>coss for each<br>0.00  | equiremen<br>isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>m<br>18.64<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00   | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>month (55<br>0.00<br>storage or c<br>0.00<br>om Table 3<br>0.00  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00                                       | <ul> <li>= (25 x N) +</li> <li>May</li> <li>tor from Table</li> <li>81.86</li> <li>3600 kWh/m</li> <li>107.25</li> <li>16.09</li> <li>0.00</li> <li>VWHRS (56)m</li> <li>0.00</li> <li>0.00</li> </ul>  | 36<br>Jun<br>le 1c x (43)<br>78.37<br>0nth (see 1<br>92.55<br>13.88<br>0.00<br>n x [(47) - \<br>0.00                                | Jul<br>78.37<br>Fables 1b,<br>85.76<br>12.86<br>0.00<br>/s] ÷ (47),<br>0.00<br>0.00                                  | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00                                 | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00  | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00<br>0.00   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00                            | ) (42)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)<br>(59)                         |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage loo<br>If the vessel con<br>Primary circuit loo<br>Combi loss for e                    | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>tains dedica<br>0.00<br>oss for each<br>0.00<br>ach month  | equiremen<br>isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>m<br>18.64<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00<br>from Table                                     | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>19.23<br>19.23<br>19.23<br>19.23<br>10.00<br>torage or c<br>0.00<br>m Table 3<br>0.00<br>23, 3b or 3   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77<br>16.77<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00<br>c                         | <ul> <li>= (25 x N) + May</li> <li>tor from Table</li> <li>81.86</li> <li>3600 kWh/m</li> <li>107.25</li> <li>16.09</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> </ul>  | 36<br>Jun<br>le 1c x (43)<br>78.37<br>0000 1<br>92.55<br>13.88<br>0.00<br>n x [(47) - V<br>0.00                                     | Jul<br>78.37<br>Fables 1b,<br>85.76<br>12.86<br>0.00<br>/s] ÷ (47),<br>0.00<br>0.00                                  | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00                                 | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00<br>0.00  | <b>Oct</b><br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00<br>0.00<br>0.00   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00<br>0.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00<br>0.00                    | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)<br>(57)                 |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage loo<br>If the vessel con<br>Primary circuit loo<br>Combi loss for e                    | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>c 0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>tains dedica<br>0.00<br>tains dedica<br>0.00<br>coss for each<br>0.00<br>ach month<br>48.81                | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>m<br>18.64<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00<br>from Table<br>42.49                             | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>month (55<br>0.00<br>storage or c<br>0.00<br>com Table 3<br>0.00<br>storage or 3<br>a, 3b or 3   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00<br>c<br>42.08                         | <ul> <li>= (25 x N) +</li> <li>May</li> <li>tor from Table</li> <li>81.86</li> <li>3600 kWh/m</li> <li>107.25</li> <li>16.09</li> <li>16.09</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>41.71</li> </ul>                                   | 36<br>Jun<br>le 1c x (43)<br>78.37<br>0nth (see 1<br>92.55<br>13.88<br>0.00<br>n x [(47) - V<br>0.00<br>0.00                        | Jul<br>78.37<br>Fables 1b,<br>85.76<br>12.86<br>0.00<br>/s] ÷ (47),<br>0.00<br>0.00<br>39.94                         | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00<br>41.71                        | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00<br>42.08                                       | Oct<br>88.82<br>Σ(44)1<br>116.05<br>Σ(45)1<br>17.41<br>0.00<br>0.00<br>45.26   | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00<br>0.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00<br>0.00<br>48.81           | ) (42)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(46)<br>(56)<br>(57)<br>(59)<br>(61)         |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage loo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e<br>Total heat requi | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>tains dedica<br>0.00<br>coss for each<br>0.00<br>ach month<br>48.81<br>red for wate                          | equiremen<br>isage in litr<br><b>Feb</b><br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>m<br>18.64<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>from Table<br>42.49<br>er heating of                         | It         es per day '         Mar         ach month         88.82         18 x Vd,m x         128.20         19.23         month (55)         0.00         storage or c         0.00         mathematical states         0.00         add states         3a, 3b or 3         45.26         calculated f | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>85.34<br>anm x Tm/3<br>111.77<br>16.77<br>16.77<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00<br>c<br>42.08<br>for each mo | <ul> <li>= (25 x N) + May</li> <li>tor from Table</li> <li>81.86</li> <li>3600 kWh/m</li> <li>107.25</li> <li>16.09</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>41.71</li> <li>onth 0.85 x (</li> </ul>                      | 36<br>Jun<br>le 1c x (43)<br>78.37<br>onth (see 1<br>92.55<br>13.88<br>0.00<br>n x [(47) - \<br>0.00<br>0.00<br>38.65<br>45)m + (46 | Jul<br>78.37<br>Fables 1b,<br>85.76<br>12.86<br>0.00<br>/s] ÷ (47),<br>0.00<br>0.00<br>39.94<br>c)m + (57)           | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00<br>41.71<br>m + (59)m           | Sep<br>85.34<br>99.58<br>14.94<br>0.00<br>0.00<br>0.00<br>42.08<br>+ (61)m                    | Oct         88.82         Σ(44)1         116.05         Σ(45)1         17.41         0.00         0.00         0.00         45.26                | Nov<br>92.31<br>.12 =<br>126.68<br>.12 =<br>19.00<br>0.00<br>0.00<br>0.00  | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00<br>0.00<br>48.81           | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)<br>(59)<br>(59)<br>(61) |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Water storage loo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e<br>Total heat requi | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>95.79<br>of hot wate<br>142.05<br>c 0.15 x (45)<br>21.31<br>oss calculate<br>0.00<br>tains dedica<br>0.00<br>tains dedica<br>0.00<br>css for each<br>0.00<br>ach month<br>48.81<br>red for wate | equiremen<br>isage in litr<br>Feb<br>r day for ea<br>92.31<br>r used = 4.:<br>124.24<br>m<br>18.64<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00<br>from Table<br>42.49<br>er heating of<br>166.72 | es per day '<br>Mar<br>ach month<br>88.82<br>18 x Vd,m x<br>128.20<br>19.23<br>month (55<br>0.00<br>storage or c<br>0.00<br>m Table 3<br>0.00<br>m Table 3<br>0.00<br>a3a, 3b or 3<br>45.26<br>calculated f   | Vd,average<br>Apr<br>Vd,m = fact<br>85.34<br>111.77<br>16.77<br>16.77<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00<br>0.00<br>2<br>42.08<br>for each model<br>153.86 | <ul> <li>= (25 x N) +<br/>May</li> <li>tor from Table</li> <li>81.86</li> <li>3600 kWh/m</li> <li>107.25</li> <li>16.09</li> <li>16.09</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>0.00</li> <li>41.71</li> <li>onth 0.85 x (</li> <li>148.96</li> </ul> | 36<br>Jun<br>le 1c x (43)<br>78.37<br>92.55<br>13.88<br>0.00<br>n x [(47) - V<br>0.00<br>0.00<br>38.65<br>45)m + (46<br>131.20      | Jul<br>78.37<br>Tables 1b,<br>85.76<br>12.86<br>0.00<br>/s] ÷ (47),<br>0.00<br>0.00<br>39.94<br>0)m + (57)<br>125.70 | Aug<br>81.86<br>1c 1d)<br>98.41<br>14.76<br>0.00<br>else (56)<br>0.00<br>0.00<br>41.71<br>m + (59)m<br>140.12 | Sep<br>85.34<br>99.58<br>99.58<br>14.94<br>0.00<br>0.00<br>0.00<br>42.08<br>+ (61)m<br>141.67 | Oct         88.82         Σ(44)1         116.05         Σ(45)1         17.41         0.00         0.00         0.00         45.26         161.32 | 92.31         .12 =         126.68         .12 =         19.00         0.00         0.00         0.00         172.20 | 2.23<br>87.08<br>Dec<br>95.79<br>1044.97<br>1370.12<br>20.64<br>0.00<br>0.00<br>0.00<br>48.81<br>186.38 | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)<br>(59)<br>(59)<br>(61) |
|   | 0.00   | 0.00  | 0.00  | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00  | 0.00  | 0.00    | 0.00 (63)   |
|---|--|---|---|---|--|---|--|---|---|---|---------|---|
| Output from wat   | er heater f  | or each mo  | nth (kWh/ı  | month) (62  | 2)m + (63)m  | ı   |  |   |   |   |         |   |
|   | 190.86   | 166.72  | 173.47  | 153.86  | 148.96   | 131.20  | 125.70   | 140.12  | 141.67  | 161.32  | 172.20  | 186.38  |
|   |  |   |   |   |  |   |  |   |   | ∑(64)1  | .12 = 1 | .892.45 (64)  |
| Heat gains from   | water heat   | ing (kWh/m  | onth) 0.25  | 5 × [0.85 × (   | (45)m + (61  | .)m] + 0.8 ×  | [(46)m + (5  | 57)m + (59)   | m]  |   |         |   |
|   | 59.44  | 51.93   | 53.94   | 47.69   | 46.09  | 40.43   | 38.50  | 43.15   | 43.63   | 49.90   | 53.50   | 57.95 <mark>(65)</mark>   |
|   | -  |   |   |   |  |   |  |   |   |   |         |   |
| 5. internal gain  | lan  | Fab   | Mar   | Apr   | Max  | lun   | 1.1  | Aug   | Son   | Oct   | Nev     | Dec   |
| Motobolic gains   | Jan<br>(Table E)   | reb   | war   | Apr   | iviay  | Jun   | Jui  | Aug   | Sep   | 001   | NOV     | Dec   |
| Metabolic gains   |  | 111 22  | 111 22  | 111 22  | 111 22   | 111 22  | 111 22   | 111 22  | 111.22  | 111 22  | 111 22  |   |
| Lighting gains (co  |  | Appondix I  | 111.33  | 111.33  |  | 111.33  | 111.33   | 111.33  | 111.33  | 111.33  | 111.33  | 111.33 (66)   |
| Lighting gains (Ca  |  |   | ., equation   | L9 or L9a),   |  |   | 6.50   | 0.45  | 11.24   |   | 16.01   |   |
|   | 17.43  | 15.48   | 12.59   | 9.53  | /.13   | 6.02  | 6.50   | 8.45  | 11.34   | 14.40   | 16.81   | 17.92 (67)  |
| Appliance gains (   | calculated   | in Appendix   | k L, equatio  | on L13 or L1  | L3a), also se  | ee lable 5  |  |   |   |   |         |   |
|   | 195.42   | 197.45  | 192.34  | 181.46  | 167.73   | 154.82  | 146.20   | 144.17  | 149.28  | 160.16  | 173.89  | 186.80 (68)   |
| Cooking gains (ca   | alculated in   | Appendix I  | , equation  | L15 or L15  | a), also see   | Table 5   |  |   |   |   |         |   |
|   | 34.13  | 34.13   | 34.13   | 34.13   | 34.13  | 34.13   | 34.13  | 34.13   | 34.13   | 34.13   | 34.13   | 34.13 (69)  |
| Pump and fan ga   | ins (Table !   | 5a)   |   | 1   |  |   |  |   |   |   |         |   |
|   | 3.00   | 3.00  | 3.00  | 3.00  | 3.00   | 3.00  | 3.00   | 3.00  | 3.00  | 3.00  | 3.00    | 3.00 (70)   |
| Losses e.g. evapo   | oration (Tal   | ole 5)  |   |   |  |   |  |   |   |   | 1       |   |
|   | -89.06   | -89.06  | -89.06  | -89.06  | -89.06   | -89.06  | -89.06   | -89.06  | -89.06  | -89.06  | -89.06  | -89.06 (71)   |
| Water heating ga  | ains (Table  | 5)  |   |   |  |   |  |   |   |   |         |   |
|   | 79.89  | 77.28   | 72.50   | 66.23   | 61.95  | 56.16   | 51.75  | 58.00   | 60.60   | 67.08   | 74.31   | 77.88 (72)  |
| Total internal ga   | ins (66)m +  | + (67)m + (6  | 8)m + (69)ı   | m + (70)m -   | + (71)m + (7   | 72)m  |  |   |   |   |         |   |
|   |  |   | , , ,   | ( - /   | . , .  | _,  |  |   |   |   | -       |   |
|   | 352.14   | 349.61  | 336.83  | 316.62  | 296.20   | 276.39  | 263.84   | 270.01  | 280.62  | 301.03  | 324.41  | 342.00 (73)   |
| 6 Solar gains   | 352.14   | 349.61  | 336.83  | 316.62  | 296.20   | 276.39  | 263.84   | 270.01  | 280.62  | 301.03  | 324.41  | 342.00 (73)   |
| 6. Solar gains  | 352.14   | 349.61  | 336.83  | 316.62  | 296.20   | 276.39  | 263.84   | 270.01  | 280.62  | 301.03<br>FF  | 324.41  | 342.00 (73)   |
| 6. Solar gains  | 352.14   | 349.61  | 336.83<br>Access f<br>Table   | 316.62<br>actor<br>6d   | 296.20<br>Area<br>m <sup>2</sup>   | 276.39<br>Sola  | 263.84<br>ar flux<br>//m²  | 270.01<br>spec  | 280.62<br>g<br>ific data  | 301.03<br>FF<br>specific c  | 324.41  | 342.00 (73)<br>Gains<br>W   |
| 6. Solar gains  | 352.14   | 349.61  | 336.83<br>Access f<br>Table   | 316.62<br>actor<br>6d   | 296.20<br>Area<br>m <sup>2</sup>   | 276.39<br>Sola<br>W   | 263.84<br>ar flux<br>//m²  | 270.01<br>spec<br>or T  | 8<br>ific data<br>able 6b   | 301.03<br>FF<br>specific c<br>or Table  | 324.41  | 342.00 (73)<br>Gains<br>W   |
| 6. Solar gains SouthWest  | 352.14   | 349.61  | 336.83<br>Access f<br>Table   | 316.62<br>Factor<br>6d  | 296.20<br>Area<br>m <sup>2</sup><br>4.74   | 276.39<br>Sola<br>X<br>X 3  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x  | 270.01<br>spec<br>or T<br>0.9 x   | g<br>ific data<br>able 6b   | 301.03<br>FF<br>specific c<br>or Table<br>0.70  | 324.41  | 342.00 (73)<br>Gains<br>W<br>53.30 (79)   |
| 6. Solar gains<br>SouthWest<br>NorthEast  | 352.14   | 349.61  | 336.83<br>Access f<br>Table   | 316.62<br>actor<br>6d<br>7 x [<br>7 x [   | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42  | 276.39<br>Sola<br>X 3<br>X 1  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 270.01<br>spec<br>or T<br>0.9 x (0  | <b>g</b><br>ific data<br>able 6b<br>0.63 x<br>x   | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70  | 324.41  | 342.00 (73)<br>Gains<br>W<br>53.30 (79)<br>35.93 (75)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa   | 352.14<br>tts ∑(74)m   | 349.61  | 336.83<br>Access f<br>Table   | 316.62<br>actor<br>6d<br>7 x [<br>7 x ]   | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42  | 276.39<br>Sola<br>X 3<br>X 1  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 270.01<br>spec<br>or T<br>0.9 x<br>0.9 x  | <b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x  | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70  | 324.41  | 342.00       (73)         Gains       V         53.30       (79)         35.93       (75)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa   | 352.14<br>tts Σ(74)m<br>89.23  | 349.61<br>(82)m<br>163.93   | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99   | 316.62<br>actor<br>6d<br>7 x<br>7 x<br>370.32   | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29  | 276.39<br>Sola<br>X 3<br>X 1<br>481.27  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12  | 270.01<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>382.50  | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>295.07                                     | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72  | 324.41  | 342.00 (73)<br>Gains<br>W<br>53.30 (79)<br>35.93 (75)<br>74.96 (83)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte   | 352.14<br>tts ∑(74)m<br>89.23<br>rnal and so   | 349.61<br>(82)m<br>163.93<br>lar (73)m +  | 336.83<br>Access f<br>Table<br>0.7<br>255.99<br>(83)m   | 316.62<br>actor<br>6d<br>7 x [<br>7 x ]<br>370.32   | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29  | 276.39<br>Sol:<br>X 3<br>X 1<br>481.27  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12  | 270.01<br>spec<br>or T<br>0.9 x (0)<br>0.9 x (0)<br>382.50  | <b>8</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>295.07  | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72  | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte   | 352.14<br>tts Σ(74)m<br>89.23<br>rnal and so<br>441.37   | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54  | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83  | 316.62<br>actor<br>6d<br>7 x 7<br>7 x 7<br>370.32<br>686.94   | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49  | 276.39<br>Sola<br>X 3<br>X 1<br>481.27<br>757.67  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96  | 270.01<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>382.50<br>652.51  | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69                                     | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75  | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte   | 352.14<br>tts ∑(74)m<br>89.23<br>rnal and so<br>441.37   | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54  | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83  | 316.62<br>actor<br>6d<br>7 x<br>7 x<br>370.32<br>686.94   | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49  | 276.39<br>Sol:<br>W<br>x 3<br>x 1<br>481.27<br>757.67   | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96  | 270.01<br>spec<br>or T<br>0.9 x ()<br>0.9 x ()<br>382.50<br>652.51  | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>295.07<br>575.69                           | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75  | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)   |
| 6. Solar gains<br>SouthWest<br>NorthEast<br>Solar gains in wa<br>Total gains - inte<br>7. Mean interna  | 352.14<br>tts Σ(74)m<br>89.23<br>rnal and so<br>441.37<br>al tempera   | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin  | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>ng season)  | 316.62<br>actor<br>6d<br>7 x (<br>7 x (<br>370.32<br>686.94   | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49  | 276.39<br>Sola<br>X 3<br>X 1<br>481.27<br>757.67  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96  | 270.01<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>382.50<br>652.51  | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69                                     | 301.03<br><b>FF</b><br><b>specific c</b><br><b>or Table</b><br>0.70<br>0.70<br>189.72<br>490.75                             | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains -</li></ul>                     | 352.14<br>tts ∑(74)m<br>89.23<br>rnal and so<br>441.37<br>al tempera   | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heating periods in  | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>ng season)<br>the living a  | 316.62<br>actor<br>6d<br>7 x 7<br>7 x 7<br>370.32<br>686.94<br>area from T  | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49  | 276.39<br>Sol:<br>W<br>x 3<br>x 1<br>481.27<br>757.67<br>(°C)   | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96  | 270.01<br>spec<br>or T<br>0.9 x ()<br>0.9 x ()<br>382.50<br>652.51  | 280.62<br><b>g</b><br><b>ific data</b><br><b>able 6b</b><br>0.63 x<br>0.63 x<br>295.07<br>575.69      | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75  | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)  |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains</li></ul> | 352.14<br>tts ∑(74)m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan  | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heating periods in<br>Feb   | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>ng season)<br>the living a<br>Mar   | 316.62<br>actor<br>6d<br>7 x 7<br>7 x 7<br>370.32<br>686.94<br>area from T<br>Apr   | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49  | 276.39<br>Sola<br>X 3<br>X 1<br>481.27<br>757.67<br>(°C)<br>Jun   | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96  | 270.01<br>spec<br>or T<br>0.9 x (0<br>0.9 x (0<br>382.50<br>652.51  | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69<br>Sep                              | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75<br>Oct   | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (73)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains</li></ul> | 352.14<br>tts ∑(74)m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan<br>for gains fr  | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin<br>g periods in<br>Feb<br>or living are  | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>ng season)<br>the living a<br>Mar<br>ta n1,m (se   | 316.62<br>actor<br>6d<br>7 x 7<br>7 x 7<br>370.32<br>686.94<br>area from T<br>Apr<br>e Table 9a)  | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49  | 276.39<br>Sol:<br>W<br>X 3<br>X 1<br>481.27<br>757.67<br>(°C)<br>Jun  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96  | 270.01<br>spec<br>or T<br>0.9 x ()<br>0.9 x ()<br>382.50<br>652.51<br>Aug                                 | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>295.07<br>575.69<br>Sep                    | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75<br>Oct   | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (73)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains</li></ul> | 352.14<br>tts ∑(74)m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>1.00  | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99  | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>ng season)<br>the living a<br>Mar<br>an1,m (se<br>0.98   | 316.62         actor         6d         7       x         7       x         370.32         686.94         area from T         Apr         e Table 9a)         0.92  | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49  | 276.39<br>Sola<br>X 3<br>X 1<br>481.27<br>757.67<br>(°C)<br>Jun<br>0.57   | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96<br>Jul<br>0.42                           | 270.01<br>spec<br>or T<br>0.9 x (0)<br>0.9 x (0)<br>382.50<br>652.51<br>Aug<br>0.48                       | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69<br>Sep<br>0.76                      | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75<br>Oct<br>0.96                                   | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (86)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains</li></ul> | 352.14<br>tts Σ(74)m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>1.00<br>mp of livin   | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s  | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>(83)m<br>592.83<br>the living a<br>Mar<br>a n1,m (se<br>0.98<br>teps 3 to 7   | 316.62         actor         6d         7       x         7       x         370.32         686.94         area from T         Apr         e Table 9a)         0.92         in Table 9c  | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49<br>759.49  | 276.39<br>Sol:<br>W<br>x 3<br>x 1<br>481.27<br>(°C)<br>Jun<br>0.57  | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96<br>Jul<br>0.42                           | 270.01<br>spec<br>or T<br>0.9 x ()<br>0.9 x ()<br>382.50<br>652.51<br>Aug<br>0.48                         | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>295.07<br>575.69<br>575.69<br>0.76         | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75<br>Oct<br>0.96                                   | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (86)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains - internation</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internal ternation</li> </ul>  | 352.14<br>tts $\Sigma(74)$ m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan<br>for gains fo<br>1.00<br>mp of livin<br>19.96  | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.12   | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>mg season)<br>the living a<br>Mar<br>an 1,m (se<br>0.98<br>teps 3 to 7<br>20.38  | 316.62         actor         6d         7       x         7       x         370.32         686.94         area from T         Apr         e Table 9a)         0.92         in Table 9c         20.70  | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49<br>759.49<br>759.49<br>759.49  | 276.39<br>Sola<br>X 3<br>X 1<br>481.27<br>757.67<br>(°C)<br>Jun<br>0.57<br>20.99                                | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96<br>Jul<br>0.42<br>21.00                  | 270.01<br>spec<br>or T<br>0.9 x 0<br>0.9 x 0<br>382.50<br>652.51<br>Aug<br>0.48<br>21.00                  | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69<br>Sep<br>0.76<br>20.94             | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75<br>Oct<br>0.96<br>20.64                          | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (86)         1.00       (86)         19.93       (87)  |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - international gains</li></ul> | 352.14<br>tts $\Sigma(74)$ m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>1.00<br>mp of livin<br>19.96<br>ring heating                                | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.12<br>g periods in                                   | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>5 | 316.62         actor         6d         7       x         7       x         370.32         686.94         area from T         Apr         e Table 9a)         0.92         in Table 9c         20.70         dwelling fr                                      | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49<br>759.49<br>759.49<br>0.78<br>0.78<br>0.78                                | 276.39<br>Sol:<br>W<br>x 3<br>x 1<br>481.27<br>757.67<br>(°C)<br>Jun<br>0.57<br>20.99<br>9, Th2(°C)             | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96<br>Jul<br>0.42<br>21.00                  | 270.01<br>spec<br>or T<br>0.9 x ()<br>0.9 x ()<br>382.50<br>652.51<br>Aug<br>0.48<br>21.00                | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69<br>575.69<br>0.76<br>20.94          | 301.03<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>189.72<br>490.75<br>Oct<br>0.96<br>20.64                          | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (86)         1.9.93       (87)   |
| 6. Solar gains SouthWest NorthEast Solar gains in wa Total gains - inte 7. Mean internat Utilisation factor Mean internal te Temperature dur  | 352.14<br>tts $\Sigma(74)$ m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan<br>for gains f<br>1.00<br>mp of livin<br>19.96<br>ring heating<br>20.06                        | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.12<br>g periods in<br>20.06                          | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(84)(82)(83)m<br>592.83<br>(84)(82)(82)(82)(82)(82)(82)(82)(82)(82)(82   | 316.62         actor         6d         7       x         7       x         370.32         686.94         area from T         Apr         e Table 9a)         0.92         in Table 9c         20.70         dwelling fr         20.07                        | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49<br>759.49<br>759.49<br>0.78<br>()<br>20.91<br>rom Table 9<br>20.07         | 276.39<br>Sola<br>X 3<br>X 1<br>481.27<br>757.67<br>(°C)<br>Jun<br>0.57<br>20.99<br>9, Th2(°C)<br>20.08         | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96<br>Jul<br>0.42<br>21.00<br>20.08         | 270.01<br>spec<br>or T<br>0.9 x 0<br>0.9 x 0<br>382.50<br>652.51<br>Aug<br>0.48<br>21.00<br>20.08         | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69<br>575.69<br>0.76<br>20.94<br>20.08 | 301.03<br><b>FF specific c or Table</b><br>0.70<br>0.70<br>189.72<br>490.75<br><b>Oct</b><br>0.96<br>20.64<br>20.07         | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (86)         19.93       (87)         20.07       (88)   |
| <ul> <li>6. Solar gains</li> <li>SouthWest</li> <li>NorthEast</li> <li>Solar gains in wa</li> <li>Total gains - internation</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internal ternation</li> <li>Temperature during</li> <li>Utilisation factor</li> <li>Utilisation factor</li> </ul>  | 352.14<br>tts Σ(74)m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan<br>for gains fr<br>1.00<br>mp of livin<br>19.96<br>ring heating<br>20.06<br>for gains f                | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.12<br>g periods in<br>20.06<br>or rest of du         | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>5 | 316.62         actor         6d         7       x         7       x         370.32         686.94         area from T         Apr         e Table 9a)         0.92         in Table 9c         20.70         f dwelling fr         20.07         m            | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49<br>759.49<br>759.49<br>759.49<br>0.78<br>0.78<br>0.78<br>0.78<br>0.78      | 276.39<br>Sol:<br>W<br>X 3<br>X 1<br>481.27<br>(°C)<br>Jun<br>0.57<br>20.99<br>9, Th2(°C)<br>20.08              | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96<br>Jul<br>0.42<br>21.00<br>20.08         | 270.01  spec or T 0.9 x 0 0.9 x 0 0 382.50 652.51  Aug 0.48 21.00 20.08                                   | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69<br>575.69<br>0.76<br>20.94<br>20.08 | 301.03 FF specific c or Table 0.70 0.70 189.72 490.75 0ct 0.96 20.64 20.07  | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (86)         1.9.93       (87)         20.07       (88)  |
| 6. Solar gains SouthWest NorthEast Solar gains in wa Total gains - inte 7. Mean internat Utilisation factor Mean internal te Temperature dua Utilisation factor   | 352.14<br>tts $\Sigma(74)$ m<br>89.23<br>rnal and so<br>441.37<br>al tempera<br>ring heating<br>Jan<br>for gains f<br>1.00<br>mp of livin<br>19.96<br>ring heating<br>20.06<br>for gains f<br>1.00 | 349.61<br>(82)m<br>163.93<br>lar (73)m +<br>513.54<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.12<br>g periods in<br>20.06<br>or rest of du<br>0.99 | 336.83<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>255.99<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>592.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83)m<br>600.83<br>(83)m<br>700.83<br>(83)m<br>500.83<br>(83)m<br>500.83<br>(83 | 316.62         actor         6d         7       x         7       x         370.32         686.94         area from T         Apr         e Table 9a)         0.92         in Table 9c         20.70         dwelling fr         20.07         m         0.90 | 296.20<br>Area<br>m <sup>2</sup><br>4.74<br>10.42<br>463.29<br>759.49<br>759.49<br>759.49<br>759.49<br>0.78<br>()<br>20.91<br>rom Table 9<br>20.07<br>0.72 | 276.39<br>Sola<br>X 3<br>X 1<br>481.27<br>757.67<br>(°C)<br>Jun<br>0.57<br>20.99<br>9, Th2(°C)<br>20.08<br>0.50 | 263.84<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>455.12<br>718.96<br>Jul<br>0.42<br>21.00<br>20.08<br>0.34 | 270.01<br>spec<br>or T<br>0.9 x 0<br>0.9 x 0<br>382.50<br>652.51<br>Aug<br>0.48<br>21.00<br>20.08<br>0.39 | 280.62<br>g<br>ific data<br>able 6b<br>0.63 x<br>295.07<br>575.69<br>575.69<br>0.76<br>20.94<br>20.08 | 301.03<br><b>FF specific c or Table</b><br>0.70<br>0.70<br>189.72<br>490.75<br><b>Oct</b><br>0.96<br>20.64<br>20.07<br>0.94 | 324.41  | 342.00       (73)         Gains       (79)         53.30       (79)         35.93       (75)         74.96       (83)         416.95       (84)         21.00       (85)         Dec       (86)         1.00       (86)         19.93       (87)         20.07       (88)         1.00       (89) |

|  | 19.66  | 19.00                               | 10.27             | 10.72        | 10.00          | 20.07       | 20.08  | 20.08  | 20.02                 | 10.66         | 10.09   | 19.62   |                                    |
|--|--|-------------------------------------|-------------------|--------------|----------------|-------------|--------|--------|-----------------------|---------------|---------|---------|------------------------------------|
| 1 : . :                                  | 18.00  | 10.90                               | 19.27             | 19.75        | 19.99          | 20.07       | 20.08  | 20.08  | 20.05                 | 19.00         | (19.08  | 10.05   | ] (90)<br>] (94)                   |
| Living area fract                        | ion .  | <b>c</b>                            |                   | c            | (4 (1 4) -     |             |        |        | LI                    | ving area ÷   | (4) =   | 0.37    | ] (91)                             |
| Mean internal te                         | emperature                                     | for the wh                          | ole dwellin       | g fLA x T1 + | +(1 - fLA) x 1 | Г2          |        |        |                       |               |         | _       | ,                                  |
|  | 19.15  | 19.35                               | 19.69             | 20.09        | 20.34          | 20.42       | 20.42  | 20.42  | 20.37                 | 20.03         | 19.52   | 19.11   | (92)                               |
| Apply adjustme                           | nt to the me                                   | ean interna                         | l temperatu       | ure from Ta  | able 4e whe    | ere appropr | iate   |        |                       |               |         |         |                                    |
|  | 19.15  | 19.35                               | 19.69             | 20.09        | 20.34          | 20.42       | 20.42  | 20.42  | 20.37                 | 20.03         | 19.52   | 19.11   | (93)                               |
| 9 Space beatin                           | a roquirom                                     | ont                                 |                   |              |                |             |        |        |                       |               |         |         |                                    |
| o. Space neath                           | ig requirem                                    | Fab                                 | Mar               | A            | May            | 1           | 11     | A      | Som                   | Oct           | Nev     | Dee     |                                    |
|  | Jan  | Feb                                 | iviar             | Apr          | iviay          | Jun         | Jui    | Aug    | Sep                   | Uct           | NOV     | Dec     |                                    |
| Utilisation facto                        | r for gains, i                                 | ղm<br>ւ                             |                   |              | T              |             |        |        |                       | 1             | 1       | 1       | 1                                  |
|  | 1.00   | 0.99                                | 0.97              | 0.90         | 0.74           | 0.53        | 0.37   | 0.42   | 0.71                  | 0.94          | 0.99    | 1.00    | (94)                               |
| Useful gains, ηm                         | IGm, W (94                                     | .)m x (84)m                         | 1                 |              |                |             |        |        |                       |               |         | -       | -                                  |
|  | 439.26   | 507.85                              | 574.39            | 617.22       | 560.56         | 397.88      | 264.67 | 277.28 | 410.16                | 462.72        | 428.96  | 415.46  | (95)                               |
| Monthly average                          | e external t                                   | emperature                          | e from Tabl       | e U1         |                |             |        |        |                       |               |         |         | _                                  |
|  | 4.30   | 4.90                                | 6.50              | 8.90         | 11.70          | 14.60       | 16.60  | 16.40  | 14.10                 | 10.60         | 7.10    | 4.20    | (96)                               |
| Heat loss rate fo                        | r mean inte                                    | ernal tempe                         | erature, Lm       | , W [(39)m   | n x [(93)m -   | (96)m]      |        |        |                       |               |         |         |                                    |
|  | 1060.18  | 1029.52                             | 936.90            | 786.09       | 605.39         | 403.44      | 265.29 | 278.62 | 437.00                | 660.89        | 874.04  | 1054.67 | (97)                               |
| Space heating re                         | quirement                                      | kWh/mon                             | th 0.024 x        | [(97)m - (9  | 5)m] x (41)    | m           |        |        |                       |               |         |         |                                    |
|  | 461.96   | 350.56                              | 269.70            | 121.59       | 33.35          | 0.00        | 0.00   | 0.00   | 0.00                  | 147.43        | 320.46  | 475.57  | ]                                  |
|  |  |                                     |                   |              | •              | •           |        |        | Σ(9                   | 8)15, 10      | .12 =   | 2180.63 | (98)                               |
| Space heating re                         | quirement                                      | kWh/m²/ye                           | ear               |              |                |             |        |        |                       | (98)          | ÷ (4)   | 31.51   | (99)                               |
|  |  | ,                                   |                   |              |                |             |        |        |                       | ( )           |         |         | ], ,                               |
| 9a. Energy req                           | uirements -                                    | individual                          | heating sys       | stems inclu  | iding micro    | -CHP        |        |        |                       |               |         |         |                                    |
| Space heating                            |  |                                     |                   |              |                |             |        |        |                       |               |         |         |                                    |
| Fraction of space                        | e heat from                                    | secondary                           | /suppleme         | ntary syste  | m (table 11    | .)          |        |        |                       |               |         | 0.00    | (201)                              |
| Fraction of space                        | e heat from                                    | main syste                          | em(s)             |              |                |             |        |        |                       | 1 - (2        | 01) =   | 1.00    | (202)                              |
| Fraction of space                        | e heat from                                    | main syste                          | em 2              |              |                |             |        |        |                       |               |         | 0.00    | (202)                              |
| Fraction of total                        | space heat                                     | from main                           | system 1          |              |                |             |        |        | (20                   | 02) x [1- (20 | 3)] =   | 1.00    | (204)                              |
| Fraction of total                        | space heat                                     | from main                           | system 2          |              |                |             |        |        |                       | (202) x (20   | 03) =   | 0.00    | (205)                              |
| Efficiency of ma                         | n system 1                                     | (%)                                 |                   |              |                |             |        |        |                       |               |         | 93.40   | (206)                              |
|  | Jan  | Feb                                 | Mar               | Apr          | May            | Jun         | Jul    | Aug    | Sep                   | Oct           | Nov     | Dec     | ], ,                               |
| Space heating fu                         | iel (main sv                                   | stem 1). kV                         | Vh/month          |              |                |             |        | 0      | •                     |               |         |         |                                    |
|  | <u>191 61</u>                                  | 375 34                              | 288 76            | 130.18       | 35 71          | 0.00        | 0.00   | 0.00   | 0.00                  | 157.85        | 3/13/11 | 509.18  | 1                                  |
|  | 494.01   | 575.54                              | 200.70            | 150.10       | 55.71          | 0.00        | 0.00   | 0.00   | 5/21                  | 1)1 E 10      | 12 -    | 2224 72 | ]<br>] (211)                       |
| Matan baating                            |  |                                     |                   |              |                |             |        |        | 2(21)                 | 1)15, 10      | .12 –   | 2554.72 | ] (211)                            |
| water neating                            |  |                                     |                   |              |                |             |        |        |                       |               |         |         |                                    |
| Efficiency of war                        | er neater                                      |                                     |                   |              |                |             |        |        |                       |               |         | 1       | 1                                  |
|  | 87.19  | 86.88                               | 86.16             | 84.47        | 81.98          | 80.30       | 80.30  | 80.30  | 80.30                 | 84.83         | 86.59   | 87.31   | (217)                              |
| Water heating f                          | uel, kWh/m                                     | onth                                |                   |              |                |             |        | 1      |                       | 1             |         |         | 1                                  |
|  | 218.90   | 191.91                              | 201.33            | 182.15       | 181.71         | 163.38      | 156.53 | 174.50 | 176.42                | 190.18        | 198.87  | 213.48  |                                    |
|  |  |                                     |                   |              |                |             |        |        |                       | ∑(219a)1      | .12 =   | 2249.36 | (219)                              |
| Annual totals                            |  |                                     |                   |              |                |             |        |        |                       |               |         |         | _                                  |
| Space heating fu                         | iel - main sy                                  | stem 1                              |                   |              |                |             |        |        |                       |               |         | 2334.72 |                                    |
| Water heating for                        | uel  |                                     |                   |              |                |             |        |        |                       |               |         | 2249.36 |                                    |
| Electricity for pu                       | mps, fans a                                    | nd electric                         | keep-hot (        | Table 4f)    |                |             |        |        |                       |               |         |         |                                    |
| central heati                            |  |                                     |                   |              |                |             |        |        |                       | 1             |         |         |                                    |
| boiler flue fa                           | ng pump or                                     | water pum                           | np within w       | arm air hea  | ating unit     |             |        |        | 30.00                 |               |         |         | (230c)                             |
| Soliei hae la                            | ng pump or<br>n                                | water pur                           | np within w       | arm air hea  | ating unit     |             |        |        | 30.00<br>45.00        | ]             |         |         | (230c)<br>(230e)                   |
| Total electricity                        | ng pump or<br>n<br>for the abo                 | water pur<br>ve, kWh/ye             | np within w<br>ar | arm air hea  | ating unit     |             |        |        | 30.00<br>45.00        | ]             |         | 75.00   | (230c)<br>(230e)<br>(231)          |
| Total electricity<br>Electricity for lig | ng pump or<br>n<br>for the abov<br>hting (Appe | water pum<br>ve, kWh/ye<br>endix L) | np within w<br>ar | arm air hea  | ating unit     |             |        |        | <u>30.00</u><br>45.00 | ]             |         | 75.00   | (230c)<br>(230e)<br>(231)<br>(232) |

| 10a. Fuel costs - individual heating systems incl           | luding micro-CHP      |   |                               |                |                          |       |
|---|-----------------------|---|-------------------------------|----------------|--------------------------|-------|
|   | Fuel<br>kWh/year      |   | Fuel price                    |                | Fuel<br>cost £/year      |       |
| Space heating - main system 1                               | 2334.72               | x | 3.48                          | x 0.01 =       | 81.25                    | (240) |
| Water heating   | 2249.36               | x | 3.48                          | x 0.01 =       | 78.28                    | (247) |
| Pumps and fans  | 75.00                 | x | 13.19                         | x 0.01 =       | 9.89                     | (249) |
| Electricity for lighting                                    | 307.83                | x | 13.19                         | x 0.01 =       | 40.60                    | (250) |
| Additional standing charges                                 |                       |   |                               |                | 120.00                   | (251) |
| Total energy cost   |                       |   | (240)(242) +                  | (245)(254) =   | 330.02                   | (255) |
| 11a. SAP rating - individual heating systems inc            | luding micro-CHP      |   |                               |                |                          |       |
| Energy cost deflator (Table 12)                             |                       |   |                               |                | 0.42                     | (256) |
| Energy cost factor (ECF)                                    |                       |   |                               |                | 1.21                     | (257) |
| SAP value   |                       |   |                               |                | 83.07                    | ]     |
| SAP rating (section 13)                                     |                       |   |                               |                | 83                       | (258) |
| SAP band  |                       |   |                               |                | В                        | ]     |
| 12a. CO <sub>2</sub> emissions - individual heating systems | s including micro-CHP |   |                               |                |                          |       |
|   | Energy<br>kWh/year    |   | Emission factor<br>kg CO₂/kWh |                | Emissions<br>kg CO₂/year |       |
| Space heating - main system 1                               | 2334.72               | x | 0.22                          | =              | 504.30                   | (261) |
| Water heating   | 2249.36               | x | 0.22                          | =              | 485.86                   | (264) |
| Space and water heating                                     |                       |   | (261) + (262) + (             | 263) + (264) = | 990.16                   | (265) |
| Pumps and fans  | 75.00                 | x | 0.52                          | =              | 38.93                    | (267) |
| Electricity for lighting                                    | 307.83                | x | 0.52                          | =              | 159.76                   | (268) |
| Total CO₂, kg/year  |                       |   |                               | (265)(271) =   | 1188.85                  | (272) |
| Dwelling CO₂ emission rate                                  |                       |   |                               | (272) ÷ (4) =  | 17.18                    | (273) |

Dwelling CO<sub>2</sub> emission rate

EI value

El rating (section 14)

EI band

#### 13a. Primary energy - individual heating systems including micro-CHP

|  | Energy<br>kWh/year |   | Primary factor  |                 | Primary Energy<br>kWh/year |       |
|--|--------------------|---|-----------------|-----------------|----------------------------|-------|
| Space heating - main system 1            | 2334.72            | х | 1.22            | =               | 2848.36                    | (261) |
| Water heating                            | 2249.36            | х | 1.22            | =               | 2744.21                    | (264) |
| Space and water heating                  |                    |   | (261) + (262) + | (263) + (264) = | 5592.58                    | (265) |
| Pumps and fans                           | 75.00              | х | 3.07            | =               | 230.25                     | (267) |
| Electricity for lighting                 | 307.83             | х | 3.07            | =               | 945.04                     | (268) |
| Primary energy kWh/year                  |                    |   |                 |                 | 6767.86                    | (272) |
| Dwelling primary energy rate kWh/m2/year |                    |   |                 |                 | 97.80                      | (273) |

86.05

86

В

(274)



| Assessor name                | Mr John S       | Simpson       |               |               |               |                |           | Assessor nun               | nber           | 3722   |                    |       |
|------------------------------|-----------------|---------------|---------------|---------------|---------------|----------------|-----------|----------------------------|----------------|--------|--------------------|-------|
| Client                       |                 |               |               |               |               |                |           | Last modified              | t              | 19/11, | /2014              |       |
| Address                      | Unit 2.05       | Marine Ice    | es Haversto   | ock Hill, Loi | ndon, NW3     | 2BL            |           |                            |                |        |                    |       |
|                              |                 |               |               |               |               |                |           |                            |                |        |                    |       |
| 1. Overall dwelling dime     | nsions          |               |               |               |               |                |           |                            |                |        |                    |       |
|                              |                 |               |               | A             | Area (m²)     |                | Av        | erage storey<br>height (m) | 1              | Vo     | lume (m³)          |       |
| Lowest occupied              |                 |               |               |               | 78.70         | ](1a) x        |           | 2.60                       | ] (2a) =       |        | 204.62             | (3a)  |
| Total floor area             | (1a)            | + (1b) + (1   | c) + (1d)(    | 1n) =         | 78.70         | (4)            |           |                            |                |        |                    |       |
| Dwelling volume              |                 |               |               |               |               |                | (3        | a) + (3b) + (3             | 3c) + (3d)(3r  | n) =   | 204.62             | (5)   |
| 2. Ventilation rate          |                 |               |               |               |               |                |           |                            |                |        |                    |       |
|                              |                 |               |               |               |               |                |           |                            |                | m³     | ' per hour         |       |
| Number of chimneys           |                 |               |               |               |               |                |           | 0                          | x 40 =         |        | 0                  | (6a)  |
| Number of open flues         |                 |               |               |               |               |                |           | 0                          | x 20 =         |        | 0                  | (6b)  |
| Number of intermittent fa    | ns              |               |               |               |               |                |           | 3                          | x 10 =         |        | 30                 | (7a)  |
| Number of passive vents      |                 |               |               |               |               |                |           | 0                          | x 10 =         |        | 0                  | (7b)  |
| Number of flueless gas fire  | es              |               |               |               |               |                |           | 0                          | x 40 =         |        | 0                  | (7c)  |
|                              |                 |               |               |               |               |                |           |                            |                | Air c  | hanges pe:<br>hour | er    |
| Infiltration due to chimney  | /s, flues, fans | s, PSVs       |               | (6a)          | ) + (6b) + (7 | 7a) + (7b) + ( | (7c) =    | 30                         | ÷ (5) =        |        | 0.15               | (8)   |
| If a pressurisation test has | been carried    | d out or is i | ntended, p    | roceed to (   | (17), otherv  | vise continu   | e from (9 | ) to (16)                  |                |        |                    |       |
| Air permeability value, q50  | D, expressed    | in cubic m    | etres per h   | our per sq    | uare metre    | of envelop     | e area    |                            |                |        | 5.00               | (17)  |
| If based on air permeabilit  | y value, ther   | n (18) = [(1  | 7) ÷ 20] + (8 | 3), otherwi   | ise (18) = (1 | .6)            |           |                            |                |        | 0.40               | (18)  |
| Number of sides on which     | the dwelling    | ; is sheltere | ed            |               |               |                |           |                            |                |        | 2                  | (19)  |
| Shelter factor               |                 |               |               |               |               |                |           | 1                          | - [0.075 x (19 | )] =   | 0.85               | (20)  |
| Infiltration rate incorporat | ing shelter fa  | actor         |               |               |               |                |           |                            | (18) x (20     | D) =   | 0.34               | (21)  |
| Infiltration rate modified f | or monthly v    | vind speed    | :             |               |               |                |           |                            |                |        |                    |       |
| Jan                          | Feb             | Mar           | Apr           | May           | Jun           | Jul            | Aug       | Sep                        | Oct            | Nov    | Dec                |       |
| Monthly average wind spe     | ed from Tab     | le U2         |               |               |               |                |           |                            |                |        |                    | _     |
| 5.10                         | 5.00            | 4.90          | 4.40          | 4.30          | 3.80          | 3.80           | 3.70      | 4.00                       | 4.30           | 4.50   | 4.70               | (22)  |
| Wind factor (22)m ÷ 4        |                 |               |               |               | _             | _              |           |                            |                |        |                    | _     |
| 1.28                         | 1.25            | 1.23          | 1.10          | 1.08          | 0.95          | 0.95           | 0.93      | 1.00                       | 1.08           | 1.13   | 1.18               | (22a) |
| Adjusted infiltration rate ( | allowing for    | shelter and   | l wind facto  | or) (21) x (2 | 22a)m         | -              |           |                            |                |        |                    | _     |
| 0.43                         | 0.42            | 0.41          | 0.37          | 0.36          | 0.32          | 0.32           | 0.31      | 0.34                       | 0.36           | 0.38   | 0.40               | (22b) |
| Calculate effective air chai | nge rate for t  | he applica:   | ble case:     |               |               |                |           |                            |                |        |                    | _     |
| If mechanical ventilation    | on: air change  | e rate thro   | ugh system    |               |               |                |           |                            |                |        | N/A                | (23a) |
| If balanced with heat r      | ecovery: effic  | ciency in %   | allowing fo   | or in-use fa  | actor from    | Table 4h       |           |                            |                |        | N/A                | (23c) |
| d) natural ventilation o     | r whole hous    | se positive   | input venti   | lation from   | n loft        | 1 -            | 1         |                            | 1              |        |                    |       |
| 0.59                         | 0.59            | 0.59          | 0.57          | 0.57          | 0.55          | 0.55           | 0.55      | 0.56                       | 0.57           | 0.57   | 0.58               | (24d) |
| Effective air change rate -  | enter (24a) c   | or (24b) or   | (24c) or (24  | 1d) in (25)   | 1 -           | 1 -            | 1         |                            |                |        |                    |       |
| 0.59                         | 0.59            | 0.59          | 0.57          | 0.57          | 0.55          | 0.55           | 0.55      | 0.56                       | 0.57           | 0.57   | 0.58               | (25)  |



| Element  |   |  | а   | Gross<br>rea, m²   | Openings<br>m <sup>2</sup>  | Net a<br>A, ı  | area<br>m²   | U-value<br>W/m²K   | A x U W   | /К к-v<br>kJ,  | value,<br>/m².K  | Ахк,<br>kJ/K   |  |
|--|---|--|---|--|---|--|--|--|---|--|--|--|--|
| Window   |   |  |   |  |   | 10.  | 25 x   | 1.33   | = 13.59   | )  |  |  | (27)   |
| Door   |   |  |   |  |   | 2.1  | L4 X   | 1.00   | = 2.14  |  |  |  | (26)   |
| External wall  |   |  |   |  |   | 60.  | 77 x   | 0.18   | = 10.94   |  |  |  | (29a)  |
| Party wall   |   |  |   |  |   | 32.  | 47 X   | 0.00   | = 0.00  |  |  |  | (32)   |
| Total area of ext  | ternal eleme  | ents ∑A, m <sup>2</sup>  | 2   |  |   | 73.  | 16   |  |   |  |  |  | (31)   |
| Fabric heat loss,  | W/K = ∑(A   | × U)   |   |  |   |  |  |  | (2  | 5)(30) + (3  | 32) =  | 26.67  | (33)   |
| Heat capacity Cr   | m = ∑(А x к)  |  |   |  |   |  |  | (28)   | (30) + (32)   | + (32a)(32   | 2e) =  | N/A  | (34)   |
| Thermal mass p   | arameter (T   | MP) in kJ/r  | m²K   |  |   |  |  |  |   |  |  | 250.00   | (35)   |
| Thermal bridges  | s: Σ(L x Ψ) ca  | alculated us   | sing Appen  | dix K  |   |  |  |  |   |  |  | 6.63   | (36)   |
| Total fabric heat  | t loss  |  |   |  |   |  |  |  |   | (33) + (3  | 36) =  | 33.29  | (37)   |
|  | Jan   | Feb  | Mar   | Apr  | May   | Jun  | Jul  | Aug  | Sep   | Oct  | Nov  | Dec  | _  |
| Ventilation heat   | loss calcula  | ited month   | ily 0.33 x (2   | 25)m x (5)   |   |  |  |  |   |  |  |  |  |
|  | 40.00   | 39.76  | 39.52   | 38.41  | 38.20   | 37.23  | 37.23  | 37.05  | 37.60   | 38.20  | 38.62  | 39.06  | (38)   |
| Heat transfer co   | efficient, W  | /K (37)m +   | + (38)m   |  |   |  |  |  | •   |  |  | •  | _  |
|  | 73.29   | 73.05  | 72.81   | 71.70  | 71.49   | 70.52  | 70.52  | 70.34  | 70.89   | 71.49  | 71.91  | 72.35  | 7  |
|  |   |  |   |  |   |  |  |  | Average = 2   | <u>(</u> 39)112/   | /12 =  | 71.70  | (39)   |
| Heat loss param  | eter (HLP),   | W/m²K (39  | 9)m ÷ (4)   |  |   |  |  |  |   |  |  |  | _  |
|  | 0.93  | 0.93   | 0.93  | 0.91   | 0.91  | 0.90   | 0.90   | 0.89   | 0.90  | 0.91   | 0.91   | 0.92   |  |
|  |   |  |   |  |   |  |  |  | Average = 2   | <u>(40)112/</u>  | /12 =  | 0.91   | (40)   |
| Number of days   | in month (1   | Table 1a)  |   |  |   |  |  |  |   |  |  |  |  |
|  | 31.00   | 28.00  | 31.00   | 30.00  | 31.00   | 30.00  | 31.00  | 31.00  | 30.00   | 31.00  | 30.00  | 31.00  | (40)   |
|  |   |  |   |  |   |  |  |  |   |  |  |  |  |
|  |   |  |   |  |   |  |  |  |   |  |  |  |  |
| 4. water neat  | ng energy r   | equiremen  | t   |  |   |  |  |  |   |  |  | 2.44   |  |
| Assumed occupa   | ng energy ro<br>ancy, N   | equiremen  | t   |  |   | 26   |  |  |   |  |  | 2.44   | (42)   |
| Assumed occup<br>Annual average  | ng energy r<br>ancy, N<br>hot water u   | equiremen<br>sage in litr  | t<br>es per day   | Vd,average   | = (25 x N) +  | 36   | L.I  | <b>A</b>   | For   | 0.4  |  | 2.44<br>92.10  | _ (42)<br>_ (43)   |
| 4. water neat  | ng energy r<br>ancy, N<br>hot water u<br>Jan  | equiremen<br>Isage in litr<br><b>Feb</b>   | t<br>es per day<br><mark>Mar</mark>   | Vd,average<br><b>Apr</b>   | = (25 x N) +<br><b>May</b>  | 36<br>Jun  | lut  | Aug  | Sep   | Oct  | Nov  | 2.44<br>92.10<br>Dec   | (42)<br>(43)   |
| 4. water neat<br>Assumed occup:<br>Annual average<br>Hot water usage   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe   | equiremen<br>sage in litr<br>Feb<br>r day for ea   | t<br>es per day<br>Mar<br>ach month   | Vd,average<br><b>Apr</b><br>Vd,m = fact  | = (25 x N) +<br>May<br>for from Tabl  | 36<br>Jun<br>le 1c x (43)  | Jul  | Aug  | Sep   | Oct  | Nov  | 2.44<br>92.10<br>Dec   | ] (42)<br>] (43)   |
| 4. water neat<br>Assumed occup:<br>Annual average<br>Hot water usage   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31   | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62  | t<br>es per day '<br>Mar<br>ach month<br>93.94  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25   | = (25 x N) +<br>May<br>for from Tabl<br>86.57   | 36<br>Jun<br>le 1c x (43)<br>82.89   | Jul<br>82.89   | Aug<br>86.57   | <b>Sep</b><br>90.25   | <b>Oct</b><br>93.94  | Nov  | 2.44<br>92.10<br>Dec<br>101.31   | ] (42)<br>] (43)<br>] (43)   |
| 4. water near<br>Assumed occup:<br>Annual average<br>Hot water usage<br>Energy content   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate  | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:  | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25   | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>600 kWh/m  | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see <sup>-</sup>   | Jul<br>82.89<br>Tables 1b,   | Aug<br>86.57<br>1c 1d)   | <b>Sep</b><br>90.25   | <b>Oct</b><br>93.94<br>Σ(44)1  | Nov<br>97.62<br>12 =   | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15  | ) (42)<br>) (43)<br>) (44)   |
| 4. water near<br>Assumed occup<br>Annual average<br>Hot water usage<br>Energy content  | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23  | equiremen<br>isage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.1<br>131.40   | t<br>es per day<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>: nm x Tm/3<br>118.21  | = (25 x N) +<br>May<br>or from Tabl<br>86.57<br>600 kWh/m<br>113.42   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see <sup>-</sup><br>97.88  | Jul<br>82.89<br>Tables 1b,<br>90.70  | Aug<br>86.57<br>1c 1d)<br>104.08   | Sep<br>90.25<br>105.32  | Oct<br>93.94<br>Σ(44)1<br>122.74   | Nov<br>97.62<br>12 =<br>133.98   | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>145.49  | ) (42)<br>) (43)<br>) (44)   |
| 4. water near<br>Assumed occup:<br>Annual average<br>Hot water usage<br>Energy content   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23   | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40  | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>: nm x Tm/3<br>118.21  | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>8600 kWh/m<br>113.42   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88   | Jul<br>82.89<br>Tables 1b,<br>90.70  | Aug<br>86.57<br>1c 1d)<br>104.08   | Sep<br>90.25<br>105.32  | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1  | Nov<br>97.62<br>12 =<br>133.98<br>12 =   | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>145.49<br>1449.03   | ) (42)<br>) (43)<br>) (44)<br>) (44)   |
| 4. water near<br>Assumed occup:<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss  | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>s 0.15 x (45)  | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40  | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>anm x Tm/3<br>118.21   | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>8600 kWh/m<br>113.42   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88   | Jul<br>82.89<br>Tables 1b,<br>90.70  | Aug<br>86.57<br>1c 1d)<br>104.08   | Sep<br>90.25<br>105.32  | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1  | Nov<br>97.62<br>12 =<br>133.98<br>12 =   | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03   | ) (42)<br>) (43)<br>) (44)<br>) (44)<br>) (45)   |
| 4. water near<br>Assumed occup:<br>Annual average<br>Hot water usage<br>Energy content   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>5 0.15 x (45)<br>22.54  | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40  | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>: nm x Tm/3<br>118.21<br>17.73   | = (25 x N) +<br>May<br>or from Tabl<br>86.57<br>600 kWh/m<br>113.42   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88   | Jul<br>82.89<br>Tables 1b,<br>90.70  | Aug<br>86.57<br>1c 1d)<br>104.08   | Sep<br>90.25<br>105.32  | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1<br>18.41   | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10  | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>145.49<br>1449.03<br>21.82                                | ) (42)<br>) (43)<br>) (44)<br>) (44)<br>) (45)<br>) (46)   |
| 4. water near<br>Assumed occup:<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo  | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>c 0.15 x (45)<br>22.54<br>oss calculate  | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.2<br>131.40<br>m<br>19.71<br>ed for each   | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (55   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>anm x Tm/3<br>118.21<br>17.73<br>5) x (41)m  | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>8600 kWh/m<br>113.42   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68  | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60   | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61  | Sep<br>90.25<br>105.32<br>15.80   | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1<br>18.41   | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10  | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82  | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)   |
| 4. water near<br>Assumed occup:<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo  | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>c 0.15 x (45)<br>22.54<br>oss calculate<br>0.00  | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40<br>m<br>19.71<br>ed for each<br>0.00   | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (55<br>0.00   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>anm x Tm/3<br>118.21<br>17.73<br>5) x (41)m<br>0.00  | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>600 kWh/m<br>113.42<br>17.01   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68  | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60   | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61  | Sep<br>90.25<br>105.32<br>15.80   | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1<br>18.41   | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00                                    | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>145.49<br>1449.03<br>21.82<br>0.00                        | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)                                       |
| 4. water near<br>Assumed occup<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con  | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>s 0.15 x (45)<br>22.54<br>oss calculate<br>0.00<br>ttains dedica   | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.3<br>131.40<br>m<br>19.71<br>ed for each<br>0.00<br>ated solar s   | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (55<br>0.00<br>ttorage or c   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>: nm x Tm/3<br>118.21<br>17.73<br>5) x (41)m<br>0.00<br>ledicated W  | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>8600 kWh/m<br>113.42<br>17.01<br>0.00<br>/WHRS (56)n   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68<br>0.00<br>n x [(47) - V   | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60<br>0.00<br>Vs] ÷ (47),  | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61<br>0.00<br>else (56)   | Sep<br>90.25<br>105.32<br>15.80<br>0.00   | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1<br>18.41<br>0.00   | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00                                    | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82<br>0.00                                  | ) (42)<br>(43)<br>) (44)<br>) (44)<br>) (45)<br>) (46)<br>) (56)                                     |
| 4. water near<br>Assumed occup:<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>c 0.15 x (45)<br>22.54<br>coss calculate<br>0.00<br>ttains dedica  | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40<br>m<br>19.71<br>ed for each<br>0.00<br>ated solar s<br>0.00   | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (55<br>0.00<br>torage or c<br>0.00  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>118.21<br>118.21<br>17.73<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00                                     | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>8600 kWh/m<br>113.42<br>17.01<br>0.00<br>/WHRS (56)n<br>0.00   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68<br>0.00<br>n x [(47) - 1<br>0.00   | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60<br>0.00<br>Vs] ÷ (47),<br>0.00  | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61<br>0.00<br>else (56)<br>0.00   | Sep<br>90.25<br>105.32<br>15.80<br>0.00   | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1<br>18.41<br>0.00   | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00                                    | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82<br>0.00<br>0.00                          | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)                               |
| 4. water near<br>Assumed occup<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo  | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>s 0.15 x (45)<br>22.54<br>oss calculate<br>0.00<br>itains dedica<br>0.00<br>oss for each  | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.3<br>131.40<br>m<br>19.71<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro  | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (5!<br>0.00<br>torage or c<br>0.00<br>m Table 3   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>anm x Tm/3<br>118.21<br>17.73<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00                                 | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>8600 kWh/m<br>113.42<br>17.01<br>0.00<br>/WHRS (56)n<br>0.00   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68<br>14.68<br>0.00<br>n x [(47) - 1<br>0.00  | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60<br>13.60<br>(vs] ÷ (47),<br>0.00  | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61<br>0.00<br>else (56)<br>0.00   | Sep<br>90.25<br>105.32<br>15.80<br>0.00   | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1<br>18.41<br>0.00   | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00                                    | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82<br>0.00<br>0.00                          | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)                               |
| 4. water near<br>Assumed occup:<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo   | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>c 0.15 x (45)<br>22.54<br>coss calculate<br>0.00<br>ttains dedica<br>0.00<br>oss for each  | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40<br>m<br>19.71<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00  | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (55<br>0.00<br>torage or c<br>0.00<br>m Table 3<br>0.00   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>nm x Tm/3<br>118.21<br>17.73<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00                                  | = (25 x N) +<br>May<br>for from Tabl<br>86.57<br>8600 kWh/m<br>113.42<br>17.01<br>0.00<br>/WHRS (56)n<br>0.00   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68<br>0.00<br>n x [(47) - 1<br>0.00   | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60<br>0.00<br>Vs] ÷ (47),<br>0.00  | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61<br>0.00<br>else (56)<br>0.00   | Sep<br>90.25<br>105.32<br>15.80<br>0.00<br>0.00   | <b>Oct</b><br>93.94<br>Σ(44)1<br>122.74<br>Σ(45)1<br>18.41<br>0.00<br>0.00                                     | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00<br>0.00                            | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82<br>0.00<br>0.00                          | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)<br>(59)                         |
| 4. Water heat<br>Assumed occup<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e                      | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>s 0.15 x (45)<br>22.54<br>oss calculate<br>0.00<br>itains dedica<br>0.00<br>oss for each<br>0.00<br>rach month   | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40<br>m<br>19.71<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00<br>from Table                                    | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (5!<br>0.00<br>torage or c<br>0.00<br>m Table 3<br>0.00<br>3a, 3b or 3  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>rnm x Tm/3<br>118.21<br>17.73<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00<br>0.00<br>3c                   | = (25 x N) +<br>May<br>for from Table<br>86.57<br>8600 kWh/m<br>113.42<br>17.01<br>0.00<br>WHRS (56)n<br>0.00<br>0.00   | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68<br>14.68<br>0.00<br>n x [(47) - \<br>0.00  | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60<br>0.00<br>Vs] ÷ (47),<br>0.00<br>0.00                                  | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61<br>0.00<br>else (56)<br>0.00<br>0.00                                   | Sep<br>90.25<br>105.32<br>15.80<br>0.00<br>0.00   | Oct<br>93.94<br>$\Sigma(44)1$<br>122.74<br>$\Sigma(45)1$<br>18.41<br>0.00<br>0.00<br>0.00                      | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00<br>0.00                            | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82<br>0.00<br>0.00                          | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)<br>(59)                         |
| 4. Water head<br>Assumed occups<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e                     | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>c 0.15 x (45)<br>22.54<br>coss calculate<br>0.00<br>tains dedica<br>0.00<br>coss for each<br>0.00<br>coss for each<br>0.00<br>cach month<br>50.96                          | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.1<br>131.40<br>m<br>19.71<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00<br>from Table<br>44.93                           | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (55<br>0.00<br>torage or c<br>0.00<br>m Table 3<br>0.00<br>3a, 3b or 3<br>47.87                                       | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>anm x Tm/3<br>118.21<br>17.73<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00<br>c<br>44.51                   | = (25 x N) +<br>May<br>for from Table<br>86.57<br>8600 kWh/m<br>113.42<br>17.01<br>0.00<br>/WHRS (56)m<br>0.00<br>0.00<br>44.12                               | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68<br>0.00<br>n x [(47) - 1<br>0.00<br>0.00<br>40.88                                  | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60<br>0.00<br>vs] ÷ (47),<br>0.00<br>0.00<br>42.24                         | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61<br>0.00<br>else (56)<br>0.00<br>0.00<br>44.12                          | Sep<br>90.25<br>105.32<br>15.80<br>0.00<br>0.00<br>0.00                                       | Oct<br>93.94<br>$\Sigma(44)1$<br>122.74<br>$\Sigma(45)1$<br>18.41<br>0.00<br>0.00<br>0.00<br>47.87             | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00<br>0.00<br>0.00                    | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82<br>0.00<br>0.00<br>0.00                  | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)<br>(59)<br>(61)                 |
| 4. Water heat<br>Assumed occupi<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e<br>Total heat requi | ng energy rd<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>s $0.15 \times (45)$<br>22.54<br>oss calculate<br>0.00<br>stains dedicate<br>0.00<br>oss for each<br>0.00<br>reach month for<br>50.96<br>red for wate                     | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40<br>m<br>19.71<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00<br>from Table<br>44.93<br>er heating o           | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 x Vd,m x<br>135.59<br>20.34<br>month (59<br>20.34<br>month (59<br>0.00<br>torage or c<br>0.00<br>m Table 3<br>0.00<br>3a, 3b or 3<br>47.87<br>calculated f | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>90.25<br>rnm x Tm/3<br>118.21<br>17.73<br>5) x (41)m<br>0.00<br>ledicated W<br>0.00<br>c<br>44.51<br>for each mc    | = (25 x N) +<br>May<br>for from Table<br>86.57<br>8600 kWh/m<br>113.42<br>17.01<br>0.00<br>(WHRS (56)n<br>0.00<br>0.00<br>44.12<br>onth 0.85 x (6)            | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68<br>0.00<br>n x [(47) - \<br>0.00<br>0.00<br>40.88<br>45)m + (46)                   | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60<br>0.00<br>Vs] ÷ (47),<br>0.00<br>0.00<br>42.24<br>5)m + (57)n          | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61<br>0.00<br>else (56)<br>0.00<br>0.00<br>44.12<br>m + (59)m +           | Sep<br>90.25<br>105.32<br>15.80<br>0.00<br>0.00<br>0.00<br>44.51<br>- (61)m                   | Oct<br>93.94<br>$\Sigma$ (44)1<br>122.74<br>$\Sigma$ (45)1<br>18.41<br>0.00<br>0.00<br>0.00<br>47.87           | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00<br>0.00<br>0.00<br>48.14           | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82<br>0.00<br>0.00<br>0.00<br>0.00          | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(44)<br>(46)<br>(56)<br>(57)<br>(59)<br>(59)<br>(61)         |
| 4. Water head<br>Assumed occups<br>Annual average<br>Hot water usage<br>Energy content<br>Distribution loss<br>Water storage lo<br>If the vessel con<br>Primary circuit lo<br>Combi loss for e<br>Total heat requi | ng energy r<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>101.31<br>of hot wate<br>150.23<br>s 0.15 x (45)<br>22.54<br>oss calculate<br>0.00<br>tains dedica<br>0.00<br>tains dedica<br>0.00<br>oss for each<br>0.00<br>oss for each<br>50.96<br>red for wate<br>201.19 | equiremen<br>sage in litr<br>Feb<br>r day for ea<br>97.62<br>r used = 4.:<br>131.40<br>m<br>19.71<br>ed for each<br>0.00<br>ated solar s<br>0.00<br>month fro<br>0.00<br>from Table<br>44.93<br>er heating o<br>176.33 | t<br>es per day '<br>Mar<br>ach month<br>93.94<br>18 × Vd,m ×<br>135.59<br>20.34<br>month (55<br>0.00<br>torage or c<br>0.00<br>m Table 3<br>0.00<br>3a, 3b or 3<br>47.87<br>calculated f                       | Vd,average<br>Apr<br>Vd,m = fact<br>90.25<br>anm x Tm/3<br>118.21<br>17.73<br>5) x (41)m<br>0.00<br>dedicated W<br>0.00<br>c<br>44.51<br>for each mc<br>162.72 | = (25 x N) +<br>May<br>for from Table<br>86.57<br>8600 kWh/m<br>113.42<br>17.01<br>0.00<br>/WHRS (56)n<br>0.00<br>0.00<br>44.12<br>onth 0.85 x (20)<br>157.54 | 36<br>Jun<br>le 1c x (43)<br>82.89<br>onth (see<br>97.88<br>14.68<br>14.68<br>0.00<br>n x [(47) - 1<br>0.00<br>0.00<br>40.88<br>45)m + (46<br>138.75 | Jul<br>82.89<br>Tables 1b,<br>90.70<br>13.60<br>0.00<br>vs] ÷ (47),<br>0.00<br>0.00<br>42.24<br>5)m + (57)<br>132.94 | Aug<br>86.57<br>1c 1d)<br>104.08<br>15.61<br>0.00<br>else (56)<br>0.00<br>0.00<br>44.12<br>m + (59)m +<br>148.19 | Sep<br>90.25<br>105.32<br>105.32<br>15.80<br>0.00<br>0.00<br>0.00<br>44.51<br>(61)m<br>149.83 | Oct<br>93.94<br>$\Sigma$ (44)1<br>122.74<br>$\Sigma$ (45)1<br>18.41<br>0.00<br>0.00<br>0.00<br>47.87<br>170.61 | Nov<br>97.62<br>12 =<br>133.98<br>12 =<br>20.10<br>0.00<br>0.00<br>0.00<br>48.14<br>182.12 | 2.44<br>92.10<br>Dec<br>101.31<br>1105.15<br>1449.03<br>21.82<br>0.00<br>0.00<br>0.00<br>0.00<br>10.00 | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(46)<br>(56)<br>(57)<br>(59)<br>(59)<br>(61)<br>(62) |

|  | 0.00   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00   | 0.00   | 0.00   | 0.00  | 0.00  | 0.00  | 0.00 (63)  |
|--|--|--|--|---|--|--|--|--|---|---|---|--|
| Output from wa   | ter heater f   | or each mo   | nth (kWh/ı   | month) (62  | 2)m + (63)m  | ייייייייייייייייייייייייייייייייייייי  |  | I  |   |   | I   | , ````,  |
|  | 201.19   | 176.33   | 183.46   | 162.72  | 157.54   | 138.75   | 132.94   | 148.19   | 149.83  | 170.61  | 182.12  | 196.45   |
|  |  |  |  |   |  |  |  |  |   | 5(64)1  | 12 = 2  | 2000 13 (64)   |
| Heat gains from  | water heat   | ing (kWh/m   | nonth) 0.2   | 5 × [0.85 × (   | (45)m + (61  | )m] + 0.8 ×  | [(46)m + (   | 57)m + (59)  | ml  | 2(0.)2  |   |  |
|  | 62 69  | 54 92  | 57.05  | 50.43   | 48 74  | 42.76  | 40.72  | 45.63  | 46.15   | 52 78   | 56 58   | 61 12 (65)   |
|  | 02.05  | 54.52  | 57.05  | 50.45   | 40.74  | 42.70  | 40.72  | 45.05  | 40.15   | 52.70   | 50.50   | 01.12 (03)   |
| 5. Internal gain   | IS   |  |  |   |  |  |  |  |   |   |   |  |
|  | Jan  | Feb  | Mar  | Apr   | Мау  | Jun  | Jul  | Aug  | Sep   | Oct   | Nov   | Dec  |
| Metabolic gains  | (Table 5)  |  |  |   |  |  |  |  |   |   |   |  |
|  | 121.89   | 121.89   | 121.89   | 121.89  | 121.89   | 121.89   | 121.89   | 121.89   | 121.89  | 121.89  | 121.89  | 121.89 (66)  |
| Lighting gains (c  | alculated in   | Appendix I   | , equation   | L9 or L9a),   | also see Ta  | able 5   | •  |  |   |   | •   |  |
|  | 21.06  | 18.70  | 15.21  | 11.52   | 8.61   | 7.27   | 7.85   | 10.21  | 13.70   | 17.39   | 20.30   | 21.64 (67)   |
| Appliance gains  | (calculated  | in Appendi   | x L, equatio   | on L13 or L1  | L3a), also se  | ee Table 5   |  |  |   |   | I   | , · · ·  |
|  | 216.70   | 218.95   | 213.28   | 201.22  | 185.99   | 171.68   | 162.12   | 159.87   | 165.54  | 177.60  | 192.83  | 207.14 (68)  |
| Cooking gains (c   | alculated in   | Appendix I   |  | 15 or   15  | a), also see   | Table 5  |  | 100107   | 100101  | 111100  | 101.00  |  |
| Cooking Bring (c   | 25 10  | 25.10  | 25 10  | 25 10   | 25 10  | 25 10  | 25 10  | 25.10  | 25.10   | 25 10   | 25.10   | 35.10 (60)   |
| Pump and fan g   | ins (Table )   | 53.15<br>53)   | 55.15  | 55.15   | 55.15  | 55.15  | 55.15  | 55.15  | 55.15   | 55.15   | 55.15   | 55.15 (05)   |
|  |  | 2.00   | 2.00   | 2.00  | 2.00   | 2.00   | 2.00   | 2.00   | 2.00  | 2.00  | 2.00  | 2.00 (70)  |
|  | 3.00   | 3.00   | 3.00   | 3.00  | 3.00   | 3.00   | 3.00   | 3.00   | 3.00  | 3.00  | 3.00  | 3.00 (70)  |
| Losses e.g. evap   |  |  |  |   | 07.54  | 0  | 07.54  | 07.54  | 0   | 0==4  |   |  |
|  | -97.51   | -97.51   | -97.51   | -97.51  | -97.51   | -97.51   | -97.51   | -97.51   | -97.51  | -97.51  | -97.51  | -97.51 (71)  |
| Water heating g  | ains (Table  | 5)   |  |   |  |  |  |  |   |   |   | 11   |
|  | 84.26  | 81.73  | 76.68  | 70.04   | 65.51  | 59.39  | 54.73  | 61.34  | 64.09   | 70.94   | 78.59   | 82.15 (72)   |
| Total internal ga  | ins (66)m -  | + (67)m + (6   | i8)m + (69)ı   | m + (70)m ·   | + (71)m + (7   | 72)m   |  |  |   |   |   |  |
|  |  |  |  |   |  |  |  |  |   |   |   |  |
|  | 384.59   | 381.95   | 367.74   | 345.35  | 322.68   | 300.91   | 287.26   | 293.98   | 305.89  | 328.50  | 354.29  | 373.49 (73)  |
| 6 Solar gains  | 384.59   | 381.95   | 367.74   | 345.35  | 322.68   | 300.91   | 287.26   | 293.98   | 305.89  | 328.50  | 354.29  | 373.49 <b>(73)</b>   |
| 6. Solar gains   | 384.59   | 381.95   | 367.74   | 345.35  | 322.68   | 300.91   | 287.26   | 293.98   | 305.89  | 328.50  | 354.29  | 373.49 (73)  |
| 6. Solar gains   | 384.59   | 381.95   | 367.74<br>Access f<br>Table  | 345.35<br>actor<br>6d   | 322.68<br>Area<br>m <sup>2</sup>   | 300.91<br>Sola   | 287.26<br>ar flux<br>//m²  | 293.98<br>spec   | 305.89<br>g<br>ific data  | 328.50<br>FF<br>specific c  | 354.29  | 373.49 (73)<br>Gains<br>W  |
| 6. Solar gains   | 384.59   | 381.95   | 367.74<br>Access f<br>Table  | 345.35<br>actor<br>6d   | 322.68<br>Area<br>m <sup>2</sup>   | 300.91<br>Sola<br>W  | 287.26<br>ar flux<br>//m²  | 293.98<br>spec<br>or T   | 305.89<br>g<br>ific data<br>able 6b   | 328.50<br>FF<br>specific c<br>or Table  | 354.29<br>data<br>6c  | 373.49 (73)<br>Gains<br>W  |
| 6. Solar gains<br>SouthEast  | 384.59   | 381.95   | 367.74<br>Access f<br>Table  | 345.35<br>actor<br>6d<br>7x   | 322.68<br>Area<br>m <sup>2</sup><br>6.87   | 300.91<br>Sol:<br>W  | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x  | 293.98<br>spec<br>or T<br>0.9 x  | g<br>ific data<br>able 6b   | 328.50<br>FF<br>specific c<br>or Table<br>0.70  | 354.29  | 373.49 (73)<br>Gains<br>W<br>77.25 (77)  |
| 6. Solar gains<br>SouthEast<br>NorthWest   | 384.59   | 381.95   | 367.74<br>Access f<br>Table<br>0.7<br>0.7  | 345.35<br>actor<br>6d<br>7 x [<br>7 x [   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38   | 300.91<br>Sola<br>X 3<br>X 1   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x   | <b>g</b><br>ific data<br>able 6b<br>0.63 x<br>x   | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70  | 354.29  | 373.49 (73)<br>Gains<br>W<br>77.25 (77)<br>11.65 (81)  |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa  | <u>384.59</u><br>atts Σ(74)m   | 381.95   | 367.74<br>Access f<br>Table<br>0.7<br>0.7  | 345.35<br>actor<br>6d<br>7 x [<br>7 x [   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38   | 300.91<br>Sol:<br>X 3<br>X 1   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x   | <b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70  | 354.29  | 373.49       (73)         Gains       W         77.25       (77)         11.65       (81)  |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa  | 384.59<br>atts Σ(74)m<br>88.91   | 381.95<br>(82)m<br>155.31  | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>222.79  | 345.35<br>actor<br>6d<br>7 x<br>7 x<br>293.28   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23   | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x   | <b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42  | 354.29  | 373.49 (73)<br>Gains<br>W<br>77.25 (77)<br>11.65 (81)<br>75.63 (83)  |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa<br>Total gains - inte  | 384.59<br>atts Σ(74)m<br>88.91<br>ernal and so   | 381.95<br>(82)m<br>155.31<br>ılar (73)m +  | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>222.79<br>(83)m   | 345.35<br>actor<br>6d<br>7 x 2<br>7 x 2<br>293.28   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23   | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x<br>294.20   | <b>g</b><br><b>ific data</b><br><b>able 6b</b><br>0.63 x<br>0.63 x<br>247.03  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42  | 354.29  | 373.49       (73)         Gains       (77)         77.25       (77)         11.65       (81)         75.63       (83)  |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa<br>Total gains - inte  | 384.59<br>atts Σ(74)m<br>88.91<br>ernal and so<br>473.50   | 381.95<br>(82)m<br>155.31<br>ılar (73)m +<br>537.26  | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53   | 345.35<br>actor<br>6d<br>7 x 7<br>7 x 293.28  | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23   | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x<br>294.20<br>588.17                                   | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42  | 354.29  | 373.49 (73)<br>Gains<br>W<br>77.25 (77)<br>11.65 (81)<br>75.63 (83)<br>449.12 (84)   |
| 6. Solar gains<br>SouthEast<br>NorthWest<br>Solar gains in wa<br>Total gains - inte  | 384.59<br>atts Σ(74)m<br>88.91<br>ernal and so<br>473.50   | 381.95<br>(82)m<br>155.31<br>ılar (73)m +<br>537.26  | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53  | 345.35<br>actor<br>6d<br>7 x<br>293.28<br>638.62  | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91  | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x<br>294.20<br>588.17                                   | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92  | 354.29  | 373.49       (73)         Gains       (77)         77.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)  |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> </ul>   | 384.59<br>atts Σ(74)m<br>88.91<br>ernal and so<br>473.50<br>al tempera   | 381.95<br>(82)m<br>155.31<br>Jar (73)m +<br>537.26<br>ture (heatin   | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53<br>ng season)   | 345.35<br>actor<br>6d<br>7 x 7<br>7 x 2<br>293.28<br>638.62   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91  | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x<br>294.20<br>588.17                                   | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92  | 354.29  | 373.49       (73)         Gains       (77)         77.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)  |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> </ul>   | atts $\Sigma(74)$ m<br>88.91<br>ernal and so<br>473.50<br>al tempera   | 381.95<br>(82)m<br>155.31<br>.lar (73)m +<br>537.26<br>ture (heating periods in  | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53<br>hg season)<br>the living a  | 345.35<br>actor<br>6d<br>7 x [<br>7 x [<br>293.28<br>638.62<br>area from T  | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91<br>6666.91   | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x<br>294.20<br>588.17                                   | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92  | 354.29  | 373.49       (73)         Gains       (77)         77.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - intern</li> <li>7. Mean intern</li> <li>Temperature du</li> </ul>  | 384.59<br>atts Σ(74)m<br>88.91<br>ernal and so<br>473.50<br>al tempera<br>ring heating<br>Jan  | 381.95<br>(82)m<br>155.31<br>Jar (73)m +<br>537.26<br>ture (heating periods in<br>Feb  | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53<br>ng season)<br>the living a<br>Mar  | 345.35<br>actor<br>6d<br>7 x (<br>7 x (<br>293.28<br>638.62<br>area from T<br>Apr   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91<br>6666.91   | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56<br>.(°C)<br>Jun   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53  | 293.98<br>spec<br>or T<br>0.9 x 0<br>294.20<br>588.17<br>Aug                                   | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93         Sep                            | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct                                   | 354.29  | 373.49 (73)<br>Gains<br>W<br>77.25 (77)<br>11.65 (81)<br>75.63 (83)<br>449.12 (84)<br>21.00 (85)<br>Dec  |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>   | atts $\Sigma(74)$ m<br>88.91<br>ernal and so<br>473.50<br>al tempera<br>ring heating<br>Jan<br>r for gains f   | 381.95<br>(82)m<br>155.31<br>Jar (73)m +<br>537.26<br>ture (heatin<br>g periods in<br>Feb<br>or living are   | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53<br>(83)m<br>590.53<br>the living a<br>Mar<br>ea n1,m (se   | 345.35<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>293.28<br>638.62<br>area from T<br>Apr<br>e Table 9a)   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91<br>6666.91   | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56<br>.(°C)<br>Jun   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53  | 293.98<br>spec<br>or T<br>0.9 x 0<br>0.9 x 0<br>294.20<br>588.17<br>Aug                        | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93         Sep                            | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct                                   | 354.29  | 373.49       (73)         Gains       (77)         77.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       (85)  |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - intern</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>  | atts $\Sigma(74)$ m<br>88.91<br>ernal and soc<br>473.50<br>al tempera<br>ring heating<br>Jan<br>r for gains f<br>1.00  | 381.95<br>(82)m<br>155.31<br>Jar (73)m +<br>537.26<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99   | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53<br>(83)m<br>590.53<br>the living a<br>Mar<br>ea n1,m (se<br>0.99   | 345.35<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>293.28<br>638.62<br>area from T<br>Apr<br>e Table 9a)<br>0.95   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91<br>6666.91<br>rable 9, Th1<br>May<br>0.86  | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56<br>.(°C)<br>Jun<br>0.67   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53<br>Jul<br>0.50                             | 293.98<br>spec<br>or T<br>0.9 x 0<br>294.20<br>588.17<br>Aug<br>0.54                           | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93         Sep         0.80               | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct<br>0.97                           | 354.29  | 373.49       (73)         Gains       (77)         77.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       1.00         1.00       (86)  |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal te</li> </ul>   | atts $\Sigma(74)$ m<br>88.91<br>ernal and so<br>473.50<br>al tempera<br>ring heating<br>Jan<br>r for gains f<br>1.00<br>emp of livin   | 381.95<br>(82)m<br>155.31<br>Jar (73)m +<br>537.26<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s   | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>the living a<br>Mar<br>ea n1,m (se<br>0.99<br>teps 3 to 7   | 345.35<br>actor<br>6d<br>7 x [<br>7 x ]<br>638.62<br>area from T<br>Apr<br>e Table 9a)<br>0.95<br>in Table 9c   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91<br>6666.91<br>Table 9, Th1<br>May<br>0.86  | 300.91<br>Sol:<br>W<br>X 3<br>X 1<br>348.66<br>649.56<br>.(°C)<br>Jun<br>0.67  | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53<br>620.53                                  | 293.98<br>spec<br>or T<br>0.9 x<br>0.9 x<br>294.20<br>588.17<br>588.17<br>Aug<br>0.54          | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93         Sep         0.80               | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct<br>0.97                           | 354.29  | 373.49       (73)         Gains       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       1.00         1.00       (86)   |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wat</li> <li>Total gains - intern</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal tern</li> </ul>   | $384.59$ atts $\Sigma(74)$ m $88.91$ ernal and sc $473.50$ al tempera ring heating Jan r for gains f $1.00$ emp of livin $20.07$   | 381.95<br>(82)m<br>155.31<br>lar (73)m +<br>537.26<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.20  | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>the living a<br>Mar<br>ea n1,m (se<br>0.99<br>teps 3 to 7<br>20.41   | 345.35<br>actor<br>6d<br>7 x<br>7 x<br>293.28<br>638.62<br>638.62<br>area from T<br>Apr<br>e Table 9a)<br>0.95<br>in Table 9c<br>20.68  | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91<br>6666.91<br>able 9, Th1<br>May<br>0.86<br>c)<br>20.88  | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56<br>.(°C)<br>Jun<br>0.67<br>20.98  | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53<br>620.53<br>Jul<br>0.50<br>21.00          | 293.98<br>spec<br>or T<br>0.9 x 0<br>294.20<br>588.17<br>Aug<br>0.54<br>21.00                  | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93         Sep         0.80         20.94 | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct<br>0.97<br>20.68                  | 354.29  | 373.49       (73)         Gains       (77)         17.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       1.00         1.00       (86)         20.04       (87)                           |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wa</li> <li>Total gains - inter</li> <li>7. Mean intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal te</li> <li>Temperature du</li> </ul>   | atts $\Sigma(74)$ m<br>88.91<br>ernal and so<br>473.50<br>al tempera<br>ring heating<br>Jan<br>r for gains f<br>1.00<br>emp of livin<br>20.07<br>ring heating  | 381.95<br>(82)m<br>155.31<br>Jar (73)m +<br>537.26<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.20<br>g periods in  | 367.74<br>Access f<br>Table<br>0.7<br>0.7<br>222.79<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50<br>(83)m<br>50<br>(83)m<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50<br>(83)m<br>50)m<br>50)m<br>50<br>(83)m<br>50)m<br>50)m<br>50<br>(83)m<br>50)m<br>50)m<br>50<br>(83)m<br>50)m<br>50)m<br>50)m<br>50<br>(83)m<br>50)m<br>50)m<br>50)m<br>50)m<br>50)m<br>50)m<br>50)m<br>50  | 345.35<br>actor<br>6d<br>7 x [<br>7 x | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91<br>6666.91<br>Fable 9, Th1<br>May<br>0.86<br>(2)<br>20.88<br>rom Table 9                               | 300.91<br>Sol:<br>W<br>X 3<br>X 1<br>348.66<br>649.56<br>(°C)<br>Jun<br>0.67<br>20.98<br>O, Th2(°C)                              | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53<br>Jul<br>0.50<br>21.00                    | 293.98<br>spec<br>or T<br>0.9 x 0<br>294.20<br>588.17<br>588.17<br>Aug<br>0.54<br>21.00        | 305.89         g         ific data         able 6b         0.63       x         0.63       x         247.03         552.93         Sep         0.80         20.94 | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct<br>0.97<br>20.68                  | 354.29  | 373.49       (73)         Gains       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       1.00         1.00       (86)         20.04       (87)  |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wat</li> <li>Total gains - international term</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internation</li> <li>Temperature due</li> </ul>   | atts $\Sigma(74)$ m<br>atts | 381.95<br>(82)m<br>155.31<br>Jar (73)m +<br>537.26<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.20<br>g periods in<br>20.14   | 367.74<br>Access f<br>Table<br>0.7<br>222.79<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(90,53)<br>(83)m<br>590.53<br>(90,53)<br>(83)m<br>590.53<br>(90,53)<br>(83)m<br>590.53<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,53)<br>(90,5  | 345.35<br>actor<br>6d<br>7 x<br>7 x<br>293.28<br>638.62<br>638.62<br>638.62<br>area from T<br>Apr<br>e Table 9a)<br>0.95<br>in Table 9c<br>20.68<br>dwelling fr   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>666.91<br>666.91<br>6666.91<br>6666.91<br>0.86<br>0.86<br>0.86<br>0.86<br>0.86<br>0.87<br>20.88<br>rom Table 9 | 300.91<br>Sol:<br>W<br>348.66<br>649.56<br>(°C)<br>Jun<br>0.67<br>20.98<br>9, Th2(°C)<br>20.17                                   | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53<br>620.53<br>Jul<br>0.50<br>21.00          | 293.98 spec or T 0.9 x 0.9 x 294.20 588.17 S88.17 Aug 0.54 21.00 20 17                         | 305.89<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>247.03<br>552.93<br>552.93<br>Sep<br>0.80<br>20.94   | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct<br>0.97<br>20.68                  | 354.29  | 373.49       (73)         Gains       (77)         17.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       (86)         1.00       (86)         20.04       (87)                           |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wat</li> <li>Total gains - international sector</li> <li>7. Mean internation</li> <li>Utilisation factor</li> <li>Mean internation</li> <li>Temperature due</li> <li>Utilisation factor</li> <li>Utilisation factor</li> </ul> | atts $\Sigma(74)$ m<br>88.91<br>ernal and so<br>473.50<br>al tempera<br>ring heating<br>Jan<br>r for gains f<br>1.00<br>emp of livin<br>20.07<br>ring heating<br>20.14<br>r for gains f  | 381.95<br>(82)m<br>155.31<br>lar (73)m +<br>537.26<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.99<br>g area T1 (s<br>20.20<br>g periods in<br>20.14<br>or rest of do                        | 367.74<br>Access f<br>Table<br>0.7<br>222.79<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.53<br>(83)m<br>500.5 | 345.35<br>actor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>293.28<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62<br>638.62  | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>666.91<br>666.91<br>able 9, Th1<br>May<br>0.86<br>c)<br>20.88<br>rom Table 9<br>20.16                          | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56<br>.(°C)<br>Jun<br>0.67<br>20.98<br>9, Th2(°C)<br>20.17                         | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53<br>Jul<br>0.50<br>21.00                    | 293.98 spec or T 0.9 x 0 294.20 588.17 S88.17 Aug 0.54 21.00 20.17                             | 305.89<br>g<br>ific data<br>able 6b<br>0.63 x<br>247.03<br>247.03<br>552.93<br>Sep<br>0.80<br>20.94   | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct<br>0.97<br>20.68<br>20.16         | 354.29<br>data<br>6c<br>= [<br>107.19<br>461.48<br>[<br>Nov<br>1.00<br>20.33<br>20.16         | 373.49       (73)         Gains       (77)         17.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       (86)         1.00       (86)         20.04       (87)         20.15       (88)  |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wat</li> <li>Total gains - intern</li> <li>Total gains - intern</li> <li>Temperature du</li> <li>Utilisation factor</li> <li>Mean internal tern</li> <li>Temperature du</li> <li>Utilisation factor</li> </ul>                 | 384.59<br>atts $\Sigma(74)$ m<br>88.91<br>ernal and so<br>473.50<br>al tempera<br>ring heating<br>Jan<br>r for gains f<br>1.00<br>emp of livin<br>20.07<br>ring heating<br>20.14<br>r for gains f<br>1.00  | 381.95<br>(82)m<br>155.31<br>lar (73)m +<br>537.26<br>ture (heatin<br>g periods in<br>Feb<br>or living are<br>0.99<br>g area T1 (s<br>20.20<br>g periods in<br>20.14<br>or rest of du                          | 367.74<br>Access f<br>Table<br>0.7<br>222.79<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(83)m<br>590.53<br>(90)<br>(83)m<br>590.53<br>(90)<br>(90)<br>(90)<br>(90)<br>(90)<br>(90)<br>(90)<br>(90)   | 345.35<br>actor<br>6d<br>7 x<br>7 x<br>293.28<br>638.62<br>638.62<br>638.62<br>638.62<br>area from T<br>Apr<br>e Table 9a)<br>0.95<br>in Table 9c<br>20.68<br>dwelling fr<br>20.16<br>m<br>0.94   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>6666.91<br>6666.91<br>6666.91<br>6666.91<br>0.86<br>0.86<br>0.86<br>0.86<br>0.86<br>0.81                       | 300.91<br>Sol:<br>X<br>3<br>X 1<br>348.66<br>649.56<br>(°C)<br>Jun<br>0.67<br>20.98<br>9, Th2(°C)<br>20.17                       | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53<br>620.53<br>Jul<br>0.50<br>21.00<br>21.00 | 293.98 spec<br>or T 0.9 x 0 294.20 588.17 S88.17 Aug 0.54 21.00 20.17 0.45                     | 305.89<br><b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>247.03<br>552.93<br><b>Sep</b><br>0.80<br>20.94<br>20.17  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct<br>0.97<br>20.68<br>20.16         | 354.29  | 373.49       (73)         Gains       77.25         77.25       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       1.00         1.00       (86)         20.04       (87)         20.15       (88) |
| <ul> <li>6. Solar gains</li> <li>SouthEast</li> <li>NorthWest</li> <li>Solar gains in wat</li> <li>Total gains - international term</li> <li>Temperature due</li> <li>Utilisation factor</li> <li>Mean internation</li> <li>Temperature due</li> <li>Utilisation factor</li> <li>Mean internation</li> </ul>         | atts $\Sigma(74)$ m<br>88.91<br>ernal and so<br>473.50<br>al tempera<br>ring heating<br>Jan<br>r for gains f<br>1.00<br>emp of livin<br>20.07<br>ring heating<br>20.14<br>r for gains f<br>1.00<br>emperature  | 381.95<br>(82)m<br>155.31<br>lar (73)m +<br>537.26<br>ture (heating<br>g periods in<br>Feb<br>or living area<br>0.99<br>g area T1 (s<br>20.20<br>g periods in<br>20.14<br>or rest of du<br>0.99<br>in the rest | 367.74<br>Access f<br>Table<br>0.77<br>0.77<br>222.79<br>(83)m<br>590.53<br>ng season)<br>the living a<br>Mar<br>ea n1,m (se<br>0.99<br>teps 3 to 7<br>20.41<br>the rest of<br>20.15<br>welling n2,1<br>0.98<br>of dwelling  | 345.35         actor         6d         7       x         7       x         293.28         638.62         area from T         Apr         e Table 9a)         0.95         in Table 9c         20.68         dwelling fr         20.16         m         0.94         72 (follow)   | 322.68<br>Area<br>m <sup>2</sup><br>6.87<br>3.38<br>344.23<br>666.91<br>666.91<br>666.91<br>666.91<br>0.86<br>0.86<br>0.86<br>0.88<br>rom Table 9<br>20.88<br>rom Table 9    | 300.91<br>Sol:<br>X 3<br>X 1<br>348.66<br>649.56<br>.(°C)<br>Jun<br>0.67<br>20.98<br>9, Th2(°C)<br>20.17<br>0.59<br>7 in Table C | 287.26<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>1.28 x<br>333.26<br>620.53<br>620.53<br>Jul<br>0.50<br>21.00<br>20.17 | 293.98<br>spec<br>or T<br>0.9 x 0<br>294.20<br>588.17<br>Aug<br>0.54<br>21.00<br>20.17<br>0.45 | 305.89<br>g<br>ific data<br>able 6b<br>2.63 x<br>247.03<br>247.03<br>552.93<br>Sep<br>0.80<br>20.94<br>20.17<br>0.73  | 328.50<br>FF<br>specific c<br>or Table<br>0.70<br>0.70<br>174.42<br>502.92<br>Oct<br>0.97<br>20.68<br>20.16<br>0.95 | 354.29<br>data<br>6c<br>= [<br>107.19<br>461.48<br>[<br>Nov<br>1.00<br>20.33<br>20.16<br>0.99 | 373.49       (73)         Gains       (77)         11.65       (81)         75.63       (83)         449.12       (84)         21.00       (85)         Dec       (86)         1.00       (86)         20.04       (87)         1.00       (89)                            |

|                    | 18.89          | 19.09        | 19.39       | 19.78        | 20.05                     | 20.16       | 20.17  | 20.17  | 20.12  | 19.79         | 19.28   | 18.86   | (90)         |
|--------------------|----------------|--------------|-------------|--------------|---------------------------|-------------|--------|--------|--------|---------------|---------|---------|--------------|
| Living area fract  | ion            | II           |             |              |                           |             |        |        | Liv    | ving area ÷   | (4) =   | 0.44    | (91)         |
| Mean internal te   | emperature     | for the who  | ole dwellin | g fLA x T1 + | +(1 - fLA) x <sup>-</sup> | Г2          |        |        |        | 0             |         |         |              |
|                    | 19.40          | 19.58        | 19.84       | 20.17        | 20.41                     | 20.52       | 20.53  | 20.53  | 20.48  | 20.18         | 19.74   | 19.38   | (92)         |
| Apply adjustmer    | nt to the me   | an internal  | temperatu   | ure from Ta  | ble 4e whe                | ere appropr | iate   |        |        |               |         |         |              |
| ,                  | 19.40          | 19.58        |             | 20.17        | 20.41                     | 20.52       | 20.53  | 20.53  | 20.48  | 20.18         | 19.74   | 19.38   | (93)         |
|                    |                |              |             | _            | -                         |             |        |        |        |               |         |         | ] ( /        |
| 8. Space heatir    | ig requirem    | ient         |             |              |                           |             |        |        |        |               |         |         |              |
|                    | Jan            | Feb          | Mar         | Apr          | May                       | Jun         | Jul    | Aug    | Sep    | Oct           | Nov     | Dec     |              |
| Utilisation facto  | r for gains, ı | ղՠ           |             |              |                           |             |        |        |        |               |         |         |              |
|                    | 1.00           | 0.99         | 0.98        | 0.94         | 0.83                      | 0.63        | 0.45   | 0.49   | 0.76   | 0.95          | 0.99    | 1.00    | (94)         |
| Useful gains, ηm   | iGm, W (94     | l)m x (84)m  |             |              |                           |             |        |        |        |               |         |         |              |
|                    | 471.79         | 532.94       | 578.49      | 599.19       | 552.33                    | 407.18      | 276.25 | 288.77 | 420.90 | 480.02        | 457.73  | 447.92  | (95)         |
| Monthly average    | e external to  | emperature   | from Tabl   | e U1         |                           |             |        |        |        |               |         |         |              |
|                    | 4.30           | 4.90         | 6.50        | 8.90         | 11.70                     | 14.60       | 16.60  | 16.40  | 14.10  | 10.60         | 7.10    | 4.20    | (96)         |
| Heat loss rate fo  | r mean inte    | ernal tempe  | rature, Lm  | , W [(39)m   | ı x [(93)m -              | (96)m]      |        |        |        |               |         |         |              |
|                    | 1107.02        | 1072.12      | 971.24      | 808.21       | 622.97                    | 417.36      | 277.32 | 290.66 | 452.43 | 684.80        | 908.80  | 1098.41 | (97)         |
| Space heating re   | quirement,     | , kWh/mont   | th 0.024 x  | [(97)m - (9  | 5)m] x (41)               | m           |        |        |        |               |         |         |              |
|                    | 472.61         | 362.32       | 292.21      | 150.49       | 52.56                     | 0.00        | 0.00   | 0.00   | 0.00   | 152.36        | 324.77  | 483.96  | ]            |
|                    |                |              |             |              |                           |             |        |        | ∑(98   | 3)15, 10      | .12 =   | 2291.29 | (98)         |
| Space heating re   | quirement      | kWh/m²/ye    | ear         |              |                           |             |        |        |        | (98)          | ÷ (4)   | 29.11   | (99)         |
|                    |                |              |             |              |                           |             |        |        |        |               |         |         |              |
| 9a. Energy requ    | urements -     | Individual   | heating sys | stems inclu  | iding micro               | -СНР        |        |        |        |               |         |         |              |
| Space heating      |                |              |             |              |                           |             |        |        |        |               |         |         | 1            |
| Fraction of space  | e heat from    | secondary/   | /supplemei  | ntary syste  | m (table 11               | .)          |        |        |        |               |         | 0.00    | ] (201)      |
| Fraction of space  | e heat from    | main syste   | m(s)        |              |                           |             |        |        |        | 1 - (20       | 01) = [ | 1.00    | ] (202)      |
| Fraction of space  | e heat from    | main syste   | m 2         |              |                           |             |        |        |        |               |         | 0.00    | ] (202)      |
| Fraction of total  | space heat     | from main    | system 1    |              |                           |             |        |        | (20    | 02) x [1- (20 | 3)] = [ | 1.00    | ] (204)<br>] |
| Fraction of total  | space heat     | from main    | system 2    |              |                           |             |        |        |        | (202) x (20   | 03) =   | 0.00    | ] (205)      |
| Efficiency of mai  | n system 1     | (%)          |             |              |                           |             |        |        |        |               |         | 93.40   | (206)        |
|                    | Jan            | Feb          | Mar         | Apr          | May                       | Jun         | Jul    | Aug    | Sep    | Oct           | Nov     | Dec     |              |
| Space heating fu   | iel (main sy   | stem 1), kW  | /h/month    |              |                           |             |        |        |        |               | 1       | -1      | -            |
|                    | 506.01         | 387.93       | 312.86      | 161.13       | 56.27                     | 0.00        | 0.00   | 0.00   | 0.00   | 163.13        | 347.72  | 518.16  |              |
|                    |                |              |             |              |                           |             |        |        | ∑(211  | L)15, 10      | .12 =   | 2453.20 | (211)        |
| Water heating      |                |              |             |              |                           |             |        |        |        |               |         |         |              |
| Efficiency of wat  | er heater      |              |             |              |                           |             |        |        |        |               |         | 1       | -            |
|                    | 87.13          | 86.83        | 86.22       | 84.86        | 82.61                     | 80.30       | 80.30  | 80.30  | 80.30  | 84.77         | 86.49   | 87.23   | (217)        |
| Water heating for  | uel, kWh/m     | onth         |             |              |                           |             |        |        |        |               |         |         | _            |
|                    | 230.92         | 203.08       | 212.78      | 191.76       | 190.71                    | 172.79      | 165.55 | 184.55 | 186.59 | 201.27        | 210.57  | 225.21  |              |
|                    |                |              |             |              |                           |             |        |        |        | ∑(219a)1      | .12 =   | 2375.76 | (219)        |
| Annual totals      |                |              |             |              |                           |             |        |        |        |               |         |         |              |
| Space heating fu   | iel - main sy  | vstem 1      |             |              |                           |             |        |        |        |               |         | 2453.20 | ]            |
| Water heating for  | Jel            |              |             |              |                           |             |        |        |        |               |         | 2375.76 |              |
| Electricity for pu | mps, fans a    | ind electric | keep-hot (  | Table 4f)    |                           |             |        |        |        |               |         |         |              |
| central heati      | ng pump or     | water pum    | p within w  | arm air hea  | ating unit                |             |        |        | 30.00  | ]             |         |         | (230c)       |
| boiler flue fa     | n              |              |             |              |                           |             |        |        | 45.00  |               |         |         | (230e)       |
| Total electricity  |                |              |             |              |                           |             |        |        |        | 1             |         |         |              |
| rotal cicculary    | for the abov   | ve, kWh/yea  | ar          |              |                           |             |        |        |        | 1             |         | 75.00   | (231)        |

(265)...(271) =

(272) ÷ (4) =

| 10a. Fuel costs - individual heating systems includi | ing micro-CHP      |   |  |                   |                                       |       |
|--|--------------------|---|--|-------------------|---------------------------------------|-------|
|  | Fuel<br>kWh/year   |   | Fuel price                                 |                   | Fuel<br>cost £/year                   |       |
| Space heating - main system 1                        | 2453.20            | x | 3.48                                       | x 0.01 =          | 85.37                                 | (240) |
| Water heating  | 2375.76            | x | 3.48                                       | x 0.01 =          | 82.68                                 | (247) |
| Pumps and fans                                       | 75.00              | х | 13.19                                      | x 0.01 =          | 9.89                                  | (249) |
| Electricity for lighting                             | 371.89             | х | 13.19                                      | x 0.01 =          | 49.05                                 | (250) |
| Additional standing charges                          |                    |   |  |                   | 120.00                                | (251) |
| Total energy cost                                    |                    |   | (240)(242) -                               | + (245)(254) =    | 346.99                                | (255) |
|  |                    |   |  |                   |                                       |       |
| 11a. SAP rating - individual heating systems includ  | ling micro-CHP     | _ |  |                   |                                       | 7     |
| Energy cost deflator (Table 12)                      |                    |   |  |                   | 0.42                                  | (256) |
| Energy cost factor (ECF)                             |                    |   |  |                   | 1.18                                  | (257) |
| SAP value  |                    |   |  |                   | 83.56                                 | ]     |
| SAP rating (section 13)                              |                    |   |  |                   | 84                                    | (258) |
| SAP band   |                    |   |  |                   | В                                     | ]     |
| 12a. CO2 emissions - individual heating systems in   | cluding micro-CHP  |   |  |                   |                                       |       |
|  | Energy<br>kWh/year |   | Emission factor<br>kg CO <sub>2</sub> /kWh |                   | Emissions<br>kg CO <sub>2</sub> /year |       |
| Space heating - main system 1                        | 2453.20            | x | 0.22                                       | =                 | 529.89                                | (261) |
| Water heating  | 2375.76            | x | 0.22                                       | =                 | 513.16                                | (264) |
| Space and water heating                              |                    |   | (261) + (262) +                            | - (263) + (264) = | 1043.06                               | (265) |
| Pumps and fans                                       | 75.00              | x | 0.52                                       | =                 | 38.93                                 | (267) |
| Electricity for lighting                             | 371.89             | x | 0.52                                       | =                 | 193.01                                | (268) |

Total CO<sub>2</sub>, kg/year

Dwelling CO<sub>2</sub> emission rate

El value

El rating (section 14)

EI band

| 12 Duling and |               | a dissi dasa I ha a a | A           |              | CLID      |
|---------------|---------------|-----------------------|-------------|--------------|-----------|
| 13a. Primary  | v energy - Ir |                       | ting system | ns including | micro-CHP |
|               |               |                       |             |              |           |

|  | Energy<br>kWh/year |   | Primary factor  |                 | Primary Energy<br>kWh/year |       |
|--|--------------------|---|-----------------|-----------------|----------------------------|-------|
| Space heating - main system 1            | 2453.20            | x | 1.22            | =               | 2992.91                    | (261) |
| Water heating                            | 2375.76            | х | 1.22            | =               | 2898.43                    | (264) |
| Space and water heating                  |                    |   | (261) + (262) + | (263) + (264) = | 5891.34                    | (265) |
| Pumps and fans                           | 75.00              | х | 3.07            | =               | 230.25                     | (267) |
| Electricity for lighting                 | 371.89             | х | 3.07            | =               | 1141.69                    | (268) |
| Primary energy kWh/year                  |                    |   |                 |                 | 7263.27                    | (272) |
| Dwelling primary energy rate kWh/m2/year |                    |   |                 |                 | 92.29                      | (273) |

(272)

(273)

(274)

1274.99

16.20

86.19

86

В



| Assessor name                | Mr John S       | Simpson       |               |              |               |                     |           | Assessor nur                | nber          | 3722  |                       |                     |
|------------------------------|-----------------|---------------|---------------|--------------|---------------|---------------------|-----------|-----------------------------|---------------|-------|-----------------------|---------------------|
| Client                       |                 |               |               |              |               |                     |           | Last modified               | b             | 19/11 | /2014                 |                     |
| Address                      | Unit 3.05       | Marine Ice    | es Haversto   | ock Hill, Lo | ndon, NW3     | B 2BL               |           |                             |               |       |                       |                     |
|                              |                 |               |               |              |               |                     |           |                             |               |       |                       |                     |
| 1. Overall dwelling dime     | nsions          |               |               |              |               |                     |           |                             |               |       |                       |                     |
|                              |                 |               |               | ,            | Area (m²)     |                     | A         | verage storey<br>height (m) | 1             | Vo    | lume (m³)             |                     |
| Lowest occupied              |                 |               |               |              | 106.40        | <mark>(1a)</mark> x |           | 2.60                        | (2a) =        |       | 276.64                | (3a)                |
| Total floor area             | (1a)            | + (1b) + (1   | c) + (1d)(    | 1n) =        | 106.40        | (4)                 |           |                             |               |       |                       |                     |
| Dwelling volume              |                 |               |               |              |               |                     | (3        | 3a) + (3b) + (3             | 3c) + (3d)(3  | 8n) = | 276.64                | <mark>] (5)</mark>  |
| 2. Ventilation rate          |                 |               |               |              |               |                     |           |                             |               |       |                       |                     |
|                              |                 |               |               |              |               |                     |           |                             |               | m     | <sup>3</sup> per hour |                     |
| Number of chimneys           |                 |               |               |              |               |                     |           | 0                           | x 40 =        |       | 0                     | <mark>] (6a)</mark> |
| Number of open flues         |                 |               |               |              |               |                     |           | 0                           | x 20 =        |       | 0                     | (6b)                |
| Number of intermittent fa    | ns              |               |               |              |               |                     |           | 4                           | x 10 =        |       | 40                    | (7a)                |
| Number of passive vents      |                 |               |               |              |               |                     |           | 0                           | x 10 =        |       | 0                     | (7b)                |
| Number of flueless gas fire  | es              |               |               |              |               |                     |           | 0                           | x 40 =        |       | 0                     | (7c)                |
|                              |                 |               |               |              |               |                     |           |                             |               | Air   | changes pe<br>hour    | r                   |
| Infiltration due to chimney  | /s, flues, fans | s, PSVs       |               | (6a          | ) + (6b) + (7 | 7a) + (7b) + (      | (7c) =    | 40                          | ÷ (5) =       |       | 0.14                  | (8)                 |
| If a pressurisation test has | been carried    | d out or is i | ntended, p    | roceed to    | (17), otherv  | vise continu        | e from (9 | 9) to (16)                  |               |       |                       |                     |
| Air permeability value, q5   | D, expressed    | in cubic m    | etres per h   | our per sq   | uare metre    | e of envelop        | e area    |                             |               |       | 5.00                  | (17)                |
| If based on air permeabilit  | y value, ther   | n (18) = [(1  | 7) ÷ 20] + (8 | 3), otherw   | ise (18) = (1 | L6)                 |           |                             |               |       | 0.39                  | (18)                |
| Number of sides on which     | the dwelling    | ; is sheltere | ed            |              |               |                     |           |                             |               |       | 2                     | (19)                |
| Shelter factor               |                 |               |               |              |               |                     |           | 1                           | - [0.075 x (1 | 9)] = | 0.85                  | (20)                |
| Infiltration rate incorporat | ing shelter fa  | actor         |               |              |               |                     |           |                             | (18) x (2     | 20) = | 0.34                  | (21)                |
| Infiltration rate modified f | or monthly v    | vind speed    | :             |              |               |                     |           |                             |               |       |                       |                     |
| Jan                          | Feb             | Mar           | Apr           | May          | Jun           | Jul                 | Aug       | Sep                         | Oct           | Nov   | Dec                   |                     |
| Monthly average wind spe     | ed from Tab     | le U2         |               |              |               |                     |           |                             |               |       |                       | _                   |
| 5.10                         | 5.00            | 4.90          | 4.40          | 4.30         | 3.80          | 3.80                | 3.70      | 4.00                        | 4.30          | 4.50  | 4.70                  | (22)                |
| Wind factor (22)m ÷ 4        | _               |               |               |              |               |                     | 1         |                             | 1             |       |                       | ٦                   |
| 1.28                         | 1.25            | 1.23          | 1.10          | 1.08         | 0.95          | 0.95                | 0.93      | 1.00                        | 1.08          | 1.13  | 1.18                  | (22a)               |
| Adjusted infiltration rate ( | allowing for:   | shelter and   | I wind facto  | or) (21) x ( | 22a)m         |                     |           |                             | 1             |       | 1                     | 7                   |
| 0.43                         | 0.42            | 0.41          | 0.37          | 0.36         | 0.32          | 0.32                | 0.31      | 0.34                        | 0.36          | 0.38  | 0.39                  | _ (22b)             |
| La culate effective air cha  | nge rate for t  | ne applica    | ole case:     |              |               |                     |           |                             |               |       |                       | 7 (220)             |
| If halanced with heat r      |                 |               | allowing fo   | rin uco f    | actor from .  | Tabla 4b            |           |                             |               |       | N/A                   | ] (23d)             |
| d) natural ventilation of    | r whole hour    | se positive   | input venti   | lation from  | m loft        | 1 4018 411          |           |                             |               |       | IN/A                  | _ (230)             |
|                              | 0.59            | 0 58          | 0.57          | 0.57         | 0.55          | 0.55                | 0.55      | 0.56                        | 0.57          | 0 57  | 0.58                  | ] (24d)             |
| Effective air change rate -  | enter (24a) o   | or (24b) or   | (24c) or (24  | ld) in (25)  | 0.55          | 0.55                | 1 0.55    | 0.50                        | 0.57          | 0.57  | 0.50                  | _ (270)             |
| 0.59                         | 0.59            | 0.58          | 0.57          | 0.57         | 0.55          | 0.55                | 0.55      | 0.56                        | 0.57          | 0.57  | 0.58                  | (25)                |
| 0.55                         | 0.00            | 5.50          | 5.57          |              | 0.00          | 0.00                |           | 0.00                        | ,             | 5.57  | 0.00                  | _ 、_~/              |



| 3. Heat losses a  | and heat lo    | ss paramet       | er           |                               |                            |             |                |                  |              |                           |  |              |             |
|-------------------|----------------|------------------|--------------|-------------------------------|----------------------------|-------------|----------------|------------------|--------------|---------------------------|--|--------------|-------------|
| Element           |                |                  | а            | Gross<br>irea, m <sup>2</sup> | Openings<br>m <sup>2</sup> | s Net<br>A, | t area<br>, m² | U-value<br>W/m²K | A x U V      | V/К к- <sup>,</sup><br>kJ | value,<br>/m².K                              | Ахк,<br>kJ/K |             |
| Window            |                |                  |              |                               |                            | 20          | 0.23 x         | 1.33             | = 26.8       | 2                         |  |              | (27)        |
| Door              |                |                  |              |                               |                            | 2           | .14 x          | 1.00             | = 2.14       | +                         |  |              | (26)        |
| External wall     |                |                  |              |                               |                            | 10          | 3.05 x         | 0.18             | = 18.5       | 5                         |  |              | (29a)       |
| Party wall        |                |                  |              |                               |                            | 12          | 2.30 x         | 0.00             | = 0.00       | )                         |  |              | (32)        |
| Roof              |                |                  |              |                               |                            | 10          | 6.40 x         | 0.13             | = 13.8       | 3                         |  |              | (30)        |
| Total area of ext | ternal elem    | ents ∑A, m²      | :            |                               |                            | 23          | 1.82           |                  |              |                           |  |              | (31)        |
| Fabric heat loss, | W/K = ∑(A      | .×U)             |              |                               |                            |             |                |                  | (2           | 6)(30) + (                | 32) =  | 61.34        | (33)        |
| Heat capacity Cr  | m = Σ(А x к)   | )                |              |                               |                            |             |                | (28)             | .(30) + (32) | + (32a)(3                 | 2e) =  | N/A          | (34)        |
| Thermal mass p    | arameter (     | ГМР) in kJ/r     | n²K          |                               |                            |             |                |                  |              |                           |  | 250.00       | (35)        |
| Thermal bridges   | s: Σ(L x Ψ) c  | alculated us     | sing Appen   | dix K                         |                            |             |                |                  |              |                           |  | 10.91        | (36)        |
| Total fabric heat | t loss         |                  |              |                               |                            |             |                |                  |              | (33) + (                  | 36) =  | 72.25        | (37)        |
|                   | Jan            | Feb              | Mar          | Apr                           | May                        | Jun         | Jul            | Aug              | Sep          | Oct                       | Nov  | Dec          |             |
| Ventilation heat  | loss calcul    | ated month       | ly 0.33 x (2 | 25)m x (5)                    |                            |             |                |                  |              |                           |  |              |             |
|                   | 53.99          | 53.67            | 53.35        | 51.86                         | 51.58                      | 50.28       | 50.28          | 50.04            | 50.78        | 51.58                     | 52.14  | 52.74        | (38)        |
| Heat transfer co  | efficient, V   | -<br>V/K (37)m + | -<br>(38)m   | 4                             | •                          |             |                |                  |              | •                         |  |              |             |
|                   | 126.24         | 125.92           | 125.60       | 124.11                        | 123.83                     | 122.53      | 122.53         | 122.29           | 123.03       | 123.83                    | 124.39                                       | 124.98       | 7           |
|                   |                | -                |              | 1                             |                            |             |                |                  | Average =    | -<br>Σ(39)112             | /12 =  | 124.11       | _<br>] (39) |
| Heat loss param   | eter (HLP),    | W/m²K (39        | 9)m ÷ (4)    |                               |                            |             |                |                  | Ū            |                           | ·  |              | ` `         |
|                   | 1.19           | 1.18             | 1.18         | 1.17                          | 1.16                       | 1.15        | 1.15           | 1.15             | 1.16         | 1.16                      | 1.17   | 1.17         | 7           |
|                   |                |                  |              |                               |                            |             |                |                  | Average =    |                           | /12 =  | 1.17         | <br>(40)    |
| Number of days    | in month (     | Table 1a)        |              |                               |                            |             |                |                  |              |                           |  |              |             |
|                   | 31.00          | 28.00            | 31.00        | 30.00                         | 31.00                      | 30.00       | 31.00          | 31.00            | 30.00        | 31.00                     | 30.00  | 31.00        | (40)        |
|                   | L              |                  |              |                               |                            |             |                |                  |              | •                         | •  |              | · ·         |
| 4. Water heati    | ng energy i    | requiremen       | t            |                               |                            |             |                |                  |              |                           |  |              |             |
| Assumed occupa    | ancy, N        |                  |              |                               |                            |             |                |                  |              |                           |  | 2.79         | (42)        |
| Annual average    | hot water u    | usage in litre   | es per day   | Vd,average                    | e = (25 x N) +             | - 36        |                |                  |              |                           |  | 100.50       | (43)        |
|                   | Jan            | Feb              | Mar          | Apr                           | May                        | Jun         | Jul            | Aug              | Sep          | Oct                       | Nov  | Dec          |             |
| Hot water usage   | e in litres pe | er day for ea    | ach month    | Vd,m = fac                    | tor from Tab               | ole 1c x (4 | 3)             |                  |              |                           |  |              | _           |
|                   | 110.55         | 106.53           | 102.51       | 98.49                         | 94.47                      | 90.45       | 90.45          | 94.47            | 98.49        | 102.51                    | 106.53                                       | 110.55       |             |
|                   |                |                  |              |                               |                            |             |                |                  |              | ∑(44)1                    | 12 =   | 1205.95      | (44)        |
| Energy content    | of hot wate    | er used = 4.1    | L8 x Vd,m x  | (nm x Tm/                     | 3600 kWh/m                 | nonth (see  | e Tables 1b    | , 1c 1d)         | - <b>-</b>   |                           |  |              | _           |
|                   | 163.94         | 143.38           | 147.95       | 128.99                        | 123.77                     | 106.80      | 98.97          | 113.57           | 114.92       | 133.93                    | 146.20                                       | 158.76       |             |
|                   |                |                  |              |                               |                            |             |                |                  |              | ∑(45)1                    | 12 =   | 1581.19      | (45)        |
| Distribution loss | 6 0.15 x (45   | )m               |              |                               |                            |             | _              | _                | - <b>-</b>   |                           |  |              | _           |
|                   | 24.59          | 21.51            | 22.19        | 19.35                         | 18.57                      | 16.02       | 14.85          | 17.04            | 17.24        | 20.09                     | 21.93  | 23.81        | (46)        |
| Storage volume    | (litres) incl  | uding any se     | olar or WW   | /HRS storag                   | ge within sar              | ne vessel   |                |                  |              |                           |  | 150.00       | (47)        |
| Water storage lo  | oss:           |                  |              |                               |                            |             |                |                  |              |                           |  |              | _           |
| a) If manufactur  | er's declare   | ed loss facto    | or is known  | (kWh/day                      | )                          |             |                |                  |              |                           |  | 1.39         | (48)        |
| Temperature       | e factor from  | n Table 2b       |              |                               |                            |             |                |                  |              |                           |  | 0.54         | (49)        |
| Energy lost fi    | rom water      | storage (kW      | /h/day) (48  | 8) x (49)                     |                            |             |                |                  |              |                           |  | 0.75         | (50)        |
| Enter (50) or (54 | 1) in (55)     |                  |              |                               |                            |             |                |                  |              |                           |  | 0.75         | (55)        |
| Water storage lo  | oss calculat   | ed for each      | month (5     | 5) x (41)m                    |                            |             |                |                  |              |                           |  |              | _           |
|                   | 23.33          | 21.07            | 23.33        | 22.58                         | 23.33                      | 22.58       | 23.33          | 23.33            | 22.58        | 23.33                     | 22.58  | 23.33        | (56)        |
| If the vessel con | tains dedic    | ated solar s     | torage or c  | ledicated V                   | VWHRS (56)                 | m x [(47) · | - Vs] ÷ (47)   | , else (56)      |              |                           | <u>.                                    </u> |              | _           |
|                   | 23.33          | 21.07            | 23.33        | 22.58                         | 23.33                      | 22.58       | 23.33          | 23.33            | 22.58        | 23.33                     | 22.58  | 23.33        | (57)        |

|                    |                        | or riving are | a 111,111 (Se       |               |               |                  |                     |                     |                |                  |         | 1          | <b>.</b>    |
|--------------------|------------------------|---------------|---------------------|---------------|---------------|------------------|---------------------|---------------------|----------------|------------------|---------|------------|-------------|
| Itilication factor | Jail                   |               | 1 <b>11</b> 01      | o Tablo Oc)   | iviay         | Juli             | Jui                 | Aug                 | зеh            | 000              | NUV     | Det        |             |
| remperature du     | Ing lieduill           | E perious III | Mar                 | Λnr           | May           |                  | 11                  | Διια                | Son            | 0.0              |         | Dec        | ] (00)      |
| Temperature du     | ring heating           | g neriods in  | the living          | area from T   | able 9 Th1    | (°C)             |                     |                     |                |                  |         | 21.00      | (85)        |
| 7. Mean intern     | al tempera             | ture (heatii  | ng season)          |               |               |                  |                     |                     |                |                  |         |            |             |
|                    | 682.69                 | 825.79        | 947.88              | 1055.30       | 1118.87       | 1095.57          | 1051.07             | 989.42              | 920.33         | 801.62           | 687.23  | 639.84     | (84)        |
| Total gains - inte | ernal and so           | olar (73)m +  | (83)m               |               |               |                  |                     |                     |                |                  |         |            | _           |
|                    | 201.13                 | 346.47        | 484.33              | 617.35        | 707.21        | 709.02           | 680.69              | 612.59              | 530.23         | 385.69           | 241.61  | 171.67     | (83)        |
| Solar gains in wa  | atts ∑(74)m            | ı(82)m        |                     |               |               |                  |                     |                     |                |                  |         |            |             |
| SouthEast          |                        |               | 0.7                 | 7 x           | 16.85         | x 3              | 6.79 x              | 0.9 x               | 0.63 x         | 0.70             | =       | 189.47     | (77)        |
| NorthWest          |                        |               | 0.7                 | 7 x           | 3.38          | x 1              | 1.28 x              | 0.9 x               | 0.63 x         | 0.70             | =       | 11.65      | (81)        |
|                    |                        |               |                     |               |               |                  | -                   | or T                | able 6b        | or Table         | 6c      |            |             |
|                    |                        |               | Access f<br>Table   | actor<br>6d   | Area<br>m²    | Sola             | ar tiux<br>//m²     | spec                | g<br>ific data | FF<br>specific c | lata    | Gains<br>W |             |
| 6. Solar gains     |                        |               | A                   |               |               |                  | <b>f</b> lorer      |                     | -              |                  |         | Calm       |             |
| C. Calanation      |                        |               |                     |               |               |                  |                     |                     |                |                  |         |            |             |
|                    | 481.57                 | 479.32        | 463.55              | 437.95        | 411.66        | 386.55           | 370.38              | 376.83              | 390.10         | 415.93           | 445.62  | 468.17     | (73)        |
| Total internal ga  | ins (66)m +            | + (67)m + (6  | 8)m + (69)ı         | m + (70)m ·   | + (71)m + (7  | 72)m             |                     |                     |                |                  |         |            |             |
|                    | 123.37                 | 121.04        | 116.22              | 109.67        | 105.42        | 99.42            | 94.33               | 100.86              | 103.17         | 109.96           | 117.62  | 121.05     | (72)        |
| Water heating g    | ains (Table            | 5)            |                     |               |               |                  |                     |                     |                |                  |         |            |             |
|                    | -111.66                | -111.66       | -111.66             | -111.66       | -111.66       | -111.66          | -111.66             | -111.66             | -111.66        | -111.66          | -111.66 | -111.66    | (71)        |
| Losses e.g. evap   | oration (Tal           | ble 5)        | _                   |               |               |                  |                     | _                   | _              | _                | _       | _          |             |
|                    | 3.00                   | 3.00          | 3.00                | 3.00          | 3.00          | 3.00             | 3.00                | 3.00                | 3.00           | 3.00             | 3.00    | 3.00       | (70)        |
| Pump and fan ga    | ains (Table 5          | 5a)           |                     |               |               |                  |                     |                     |                |                  |         |            |             |
|                    | 36.96                  | 36.96         | 36.96               | 36.96         | 36.96         | 36.96            | 36.96               | 36.96               | 36.96          | 36.96            | 36.96   | 36.96      | (69)        |
| Cooking gains (c   | alculated in           | Appendix I    | ., equation         | L15 or L15    | a), also see  | Table 5          |                     |                     |                |                  |         |            |             |
|                    | 266.28                 | 269.04        | 262.08              | 247.26        | 228.54        | 210.96           | 199.21              | 196.44              | 203.41         | 218.23           | 236.94  | 254.53     | (68)        |
| Appliance gains    | (calculated            | in Appendi    | k L, equatio        | on L13 or L1  | .3a), also se | ee Table 5       |                     |                     |                |                  |         |            |             |
|                    | 24.05                  | 21.36         | 17.37               | 13.15         | 9.83          | 8.30             | 8.97                | 11.66               | 15.65          | 19.87            | 23.19   | 24.72      | (67)        |
| Lighting gains (c  | alculated in           | Appendix I    | ., equation         | L9 or L9a),   | also see Ta   | ible 5           |                     |                     |                |                  |         |            |             |
|                    | 139.57                 | 139.57        | 139.57              | 139.57        | 139.57        | 139.57           | 139.57              | 139.57              | 139.57         | 139.57           | 139.57  | 139.57     | (66)        |
| Metabolic gains    | (Table 5)              |               |                     |               |               |                  |                     |                     |                |                  |         |            | _           |
|                    | Jan                    | Feb           | Mar                 | Apr           | May           | Jun              | Jul                 | Aug                 | Sep            | Oct              | Nov     | Dec        |             |
| 5. Internal gain   | IS                     |               |                     |               |               |                  |                     |                     |                |                  |         |            |             |
|                    |                        |               |                     |               |               | . 2.00           |                     |                     |                |                  | 2       |            | ] (20)      |
|                    | 91 78                  | 81 34         | 86.47               | 78.96         | 78 43         | 71 59            | 70 18               | 75 04               | 74 29          | 81 81            | 84 68   | 90.06      | (65)        |
| Heat gains from    | water heat             | ing (kWh/m    | ionth) 0.25         | 5 × [0.85 × 1 | (45)m + (61   | .)m] + 0.8 ×     | [(46)m + (!         | 57)m + (59)         | m              | 210 172          |         |            |             |
|                    | 210.55                 | 105.40        | 194.33              | 174.08        | 170.50        | 151.50           | 145.50              | 100.10              | 100.02         | 5(64)1           | 12 = 2  | 129.81     | ]<br>[ (64) |
|                    | 210 52                 | 185 /6        | 19/ 55              | 17/ 02        | 170 26        | 151 00           | 1/15 56             | 160 16              | 160.02         | 180 52           | 101 20  | 205.26     | 1           |
| Output from wa     | L 0.00<br>ter heater f | or each mo    | nth (k\//h/         | 0.00          | )m + (63)m    | 0.00             | 0.00                | 0.00                | 0.00           | 0.00             | 0.00    | 0.00       | ן נט)       |
|                    |                        | 0.00          | 0.00                | 0.00          | 0.00          | 0.00             | 0 00                | 0.00                | 0.00           | 0.00             | 0.00    | 0.00       | (63)        |
| Solar DHW input    |                        |               | ndix G or /         | nnendiv H     | 170.30        | 101.90           | 140.00              | 100.10              | 100.02         | 100.33           | 191.29  | 203.30     | ] (02)      |
| i otai neat requi  | 210 E2                 | 185 16        |                     | 17/ 00        | 170.26        | 151 00           | 1/15 56             | 160 16              |                | 180 52           | 101 20  | 205.26     | (62)        |
| Total beat roqui   | red for wat            | or heating of | Jculatod f          | 0.00          |               | $(45)m \pm (44)$ | 0.00<br>5)m ± (57)* | 1 0.00<br>n + (50)m | 0.00           | 0.00             | 0.00    | 0.00       | ] (01)      |
| 201101 1033 101 8  |                        |               | 0.00                |               | 0.00          | 0.00             | 0.00                | 0.00                | 0.00           | 0.00             | 0.00    | 0.00       | (61)        |
| Combi loss for a   | 23.20                  | from Table    | 23.20<br>3a 3h or 3 | <br>          | 23.20         | 22.31            | 23.20               | 23.20               | 22.JI          | 23.20            | 12.21   | 23.20      | ] [22]      |
|                    | 23.26                  | 21 01         | 23.26               | 22 51         | 23.26         | 22 51            | 22.26               | 23.26               | 22 51          | 23.26            | 22 51   | 23.26      | (59)        |
| Primary circuit lo | oss for each           | month fro     | m Table 3           |               |               |                  |                     |                     |                |                  |         |            |             |

| Mean internal ten         | np of livin | g area T1 (s     | teps 3 to 7 | in Table 9    | c)           |              |          |        |        |               |         |             |                  |
|---------------------------|-------------|------------------|-------------|---------------|--------------|--------------|----------|--------|--------|---------------|---------|-------------|------------------|
|                           | 19.75       | 19.94            | 20.22       | 20.55         | 20.82        | 20.96        | 20.99    | 20.99  | 20.90  | 20.55         | 20.08   | 19.72       | (87)             |
| Temperature duri          | ng heatin   | g periods in     | the rest of | dwelling f    | rom Table 9  | 9, Th2(°C)   |          |        |        |               |         |             |                  |
| Γ                         | 19.93       | 19.93            | 19.94       | 19.95         | 19.95        | 19.96        | 19.96    | 19.96  | 19.96  | 19.95         | 19.94   | 19.94       | (88)             |
| Utilisation factor f      | for gains f | or rest of d     | welling n2, | m             | •            |              |          |        |        |               |         |             | -                |
| Г                         | 1.00        | 0.99             | 0.97        | 0.92          | 0.79         | 0.58         | 0.39     | 0.44   | 0.72   | 0.94          | 0.99    | 1.00        | (89)             |
| ∟<br>Mean internal ten    | nperature   | in the rest      | of dwelling | T2 (follow    | v steps 3 to | 7 in Table 9 | )<br>)c) | 1      | 1      |               | 1       | 1           | _ ` `            |
| Г                         | 18 27       | 18 55            | 18 95       | 19.43         | 19 78        | 19 93        | , 19.96  | 19.96  | 19.88  | 19.43         | 18 76   | 18 23       | <b>(90)</b>      |
| Living area fractio       | n 10.27     | 10.00            | 10.55       | 19.19         | 15.70        | 15.55        | 19.90    | 19.90  | 15.00  | ving area -   | (A) =   | 0.40        | ] (90)<br>] (91) |
| Moon internal ton         | nnoraturo   | for the wh       | olo dwollin | α fl Δ v T1 . | ⊾/1 fl∧\v    | тэ           |          |        | L.     | vilig alea .  | (4) -   | 0.40        |                  |
| F                         |             |                  |             |               |              | 20.24        | 20.27    | 20.27  | 20.20  | 10.07         | 10.20   | 10.02       |                  |
| A such a structure of the | 18.80       | 19.10            | 19.46       | 19.88         | 20.19        | 20.34        | 20.37    | 20.37  | 20.28  | 19.87         | 19.29   | 18.82       | ] (92)           |
| Apply adjustment          | to the me   | an internal      | temperati   | ure from Ta   | able 4e whe  | ere appropr  | late     |        |        | 1             | 1       |             | <b>-</b>         |
|                           | 18.86       | 19.10            | 19.46       | 19.88         | 20.19        | 20.34        | 20.37    | 20.37  | 20.28  | 19.87         | 19.29   | 18.82       | _ (93)           |
| 8. Space heating          | requirem    | ient             |             |               |              |              |          |        |        |               |         |             |                  |
|                           | lan         | Feb              | Mar         | Apr           | May          | lun          | Iul      | Δυσ    | Sen    | Oct           | Nov     | Dec         |                  |
| Litilisation factor f     | for gains   | nm               |             |               | ,            |              |          |        |        |               |         |             |                  |
|                           | 1 00        |                  | 0.07        | 0.02          | 0.91         | 0.62         | 0.44     | 0.49   | 0.75   | 0.04          | 0.00    | 1.00        |                  |
|                           | 1.00        | 0.99             | 0.97        | 0.92          | 0.81         | 0.62         | 0.44     | 0.48   | 0.75   | 0.94          | 0.99    | 1.00        | ] (94)           |
| Userur gains, rime        | 670.24      | ) III X (84) III | 040.04      | 0.00.04       | 004 54       | 674.00       | 457.47   | 470.04 | 606.40 | 755.00        | 670.74  |             |                  |
| L                         | 679.34      | 815.70           | 919.01      | 969.84        | 901.54       | 674.03       | 457.47   | 478.01 | 686.12 | /55.86        | 679.74  | 637.51      | ] (95)           |
| Monthly average           | external t  | emperature       | e from Tabl | e U1          |              |              |          |        |        | 1             | 1       | <del></del> | -                |
|                           | 4.30        | 4.90             | 6.50        | 8.90          | 11.70        | 14.60        | 16.60    | 16.40  | 14.10  | 10.60         | 7.10    | 4.20        | (96)             |
| Heat loss rate for        | mean inte   | ernal tempe      | rature, Lm  | , W [(39)m    | n x [(93)m - | (96)m]       |          |        |        | -             |         |             | _                |
|                           | 1837.82     | 1788.53          | 1627.18     | 1362.41       | 1051.30      | 703.26       | 461.66   | 484.96 | 760.82 | 1148.50       | 1516.00 | 1827.35     | (97)             |
| Space heating req         | uirement    | , kWh/mont       | th 0.024 x  | [(97)m - (9   | 5)m] x (41)  | m            |          |        |        |               |         |             |                  |
|                           | 861.91      | 653.75           | 526.87      | 282.65        | 111.42       | 0.00         | 0.00     | 0.00   | 0.00   | 292.12        | 602.11  | 885.24      |                  |
|                           |             |                  |             |               |              |              |          |        | ∑(98   | 8)15, 10      | .12 = 4 | ¥216.07     | (98)             |
| Space heating req         | luirement   | kWh/m²/ye        | ear         |               |              |              |          |        |        | (98)          | ÷ (4)   | 39.62       | (99)             |
|                           |             |                  |             |               |              |              |          |        |        |               |         |             |                  |
| 9a. Energy requi          | rements -   | individual       | heating sys | stems inclu   | iding micro  | о-СНР        |          |        |        |               |         |             |                  |
| Space heating             |             |                  |             |               |              |              |          |        |        |               |         |             | _                |
| Fraction of space         | heat from   | secondary        | /suppleme   | ntary syste   | m (table 11  | L)           |          |        |        |               |         | 0.00        | (201)            |
| Fraction of space         | heat from   | main syste       | m(s)        |               |              |              |          |        |        | 1 - (2        | 01) =   | 1.00        | (202)            |
| Fraction of space         | heat from   | main syste       | m 2         |               |              |              |          |        |        |               |         | 0.00        | ] (202)          |
| Fraction of total s       | pace heat   | from main        | system 1    |               |              |              |          |        | (20    | 02) x [1- (20 | 3)] =   | 1.00        | (204)            |
| Fraction of total s       | pace heat   | from main        | system 2    |               |              |              |          |        |        | (202) x (20   | 03) =   | 0.00        | (205)            |
| Efficiency of main        | system 1    | (%)              |             |               |              |              |          |        |        |               |         | 93.50       | (206)            |
|                           | Jan         | Feb              | Mar         | Apr           | May          | Jun          | Jul      | Aug    | Sep    | Oct           | Nov     | Dec         |                  |
| Space heating fue         | l (main sy  | stem 1), kW      | /h/month    |               |              |              |          |        |        |               |         |             |                  |
| Γ                         | 921.83      | 699.19           | 563.50      | 302.30        | 119.17       | 0.00         | 0.00     | 0.00   | 0.00   | 312.43        | 643.96  | 946.78      | 7                |
| L                         |             |                  |             |               | ļ            |              | 1        | 1      | Σ(21)  | 1)15. 10      | .12 = 4 | 1509.16     | ]<br>(211)       |
| Water heating             |             |                  |             |               |              |              |          |        | 21     | _,,           |         |             | ] (,             |
| Efficiency of wate        | r heater    |                  |             |               |              |              |          |        |        |               |         |             |                  |
|                           | 20 10       | 87.00            | 87 34       | 86.10         | 82 71        | 70.90        | 70.90    | 70.90  | 70.90  | 86.00         | 87.67   | 88.77       | ר <u>(</u> 217)  |
| Water boating for         | 00.10       | 07.50            | 07.34       | 00.10         | 05./1        | 79.00        | 79.00    | 19.00  | 79.00  | 00.09         | 07.07   | 00.27       | _ (21/)          |
|                           | -,          |                  | 222 74      | 202.40        | 202 54       | 100.24       | 102.44   | 200 74 | 200 52 | 200 70        | 210.20  | 222.64      | Г                |
| L                         | 238./5      | 211.01           | 222.74      | 202.19        | 203.51       | 190.34       | 182.41   | 200.71 | 200.52 | 209.70        | 12 .20  | 232.64      |                  |
|                           |             |                  |             |               |              |              |          |        |        | ∑(219a)1      | .12 = 2 | 512.73      | _ (219)          |

### Annual totals

| Space neating rulei - main system 1  |   |                                      |   |   | 4509.16  |   |
|--|---|--------------------------------------|---|---|--|---|
| Water heating fuel   |   |                                      |   |   | 2512.73  | ]   |
| Electricity for pumps, fans and electric keep-hot (Table 4f)   |   |                                      |   |   |  |   |
| central heating pump or water pump within warm air heating $\iota$   | init  |                                      | 30.00   |   |  | (230c)  |
| boiler flue fan  |   |                                      | 45.00   |   |  | (230e)  |
| Total electricity for the above, kWh/year  |   |                                      |   |   | 75.00  | (231)   |
| Electricity for lighting (Appendix L)  |   |                                      |   |   | 424.75   | (232)   |
| Total delivered energy for all uses  |   | (211).                               | (221) + (231) +   | (232)(237b) =   | 7521.64  | (238)   |
|  |   |                                      |   |   |  |   |
| 10a. Fuel costs - Individual heating systems including micro-CHP   | Final   |                                      | Fuel maine  |   | Final  |   |
|  | kWh/year  |                                      | Fuel price  |   | cost £/year  |   |
| Space heating - main system 1  | 4509.16   | x                                    | 3.48  | x 0.01 =  | 156.92   | (240)   |
| Water heating  | 2512.73   | x                                    | 3.48  | x 0.01 =  | 87.44  | (247)   |
| Pumps and fans   | 75.00   | x                                    | 13.19   | x 0.01 =  | 9.89   | (249)   |
| Electricity for lighting   | 424.75  | x                                    | 13.19   | x 0.01 =  | 56.02  | (250)   |
| Additional standing charges  |   |                                      |   |   | 120.00   | (251)   |
| Total energy cost  |   |                                      | (240)(242) +  | - (245)(254) =  | 430.28   | (255)   |
| 11a. SAP rating - individual heating systems including micro-CHF   | <b>,</b>  |                                      |   |   |  |   |
| Energy cost deflator (Table 12)  |   |                                      |   |   | 0.42   | (256)   |
| Energy cost factor (FCE)   |   |                                      |   |   | 1 19   | ] (257)   |
|  |   |                                      |   |   | 83.35  | ] (237)   |
| SAP rating (section 12)  |   |                                      |   |   | 83.35  | ]<br>] (258)  |
| SAP hand   |   |                                      |   |   | B  | ] (230)   |
| SAF ballu  |   |                                      |   | l   | D  |   |
|  |   |                                      |   |   |  |   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro-   | СНР   |                                      |   |   |  |   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro-   | CHP<br>Energy<br>kWh/year   |                                      | Emission factor<br>kg CO <sub>2</sub> /kWh  |   | Emissions<br>kg CO2/year   |   |
| <b>12a.</b> CO <sub>2</sub> emissions - individual heating systems including micro-<br>Space heating - main system 1   | CHP<br>Energy<br>kWh/year<br>4509.16  | x                                    | Emission factor<br>kg CO <sub>2</sub> /kWh  | =   | Emissions<br>kg CO <sub>2</sub> /year<br>973.98  | (261)   |
| <b>12a.</b> CO <sub>2</sub> emissions - individual heating systems including micro-<br>Space heating - main system 1<br>Water heating  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73   | x<br>x                               | Emission factor<br>kg CO <sub>2</sub> /kWh  | =   | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75  | ] (261)<br>] (264)  |
| <b>12a.</b> CO <sub>2</sub> emissions - individual heating systems including micro-<br>Space heating - main system 1<br>Water heating<br>Space and water heating   | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73   | x<br>x                               | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +   | =  <br>=  <br>(263) + (264) =   | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73   | ] (261)<br>] (264)<br>] (265)   |
| <b>12a. CO₂ emissions - individual heating systems including micro</b><br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00  | x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52   | =  <br>=  <br>(263) + (264) =  <br>=  | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93  | ] (261)<br>] (264)<br>] (265)<br>] (267)  |
| <b>12a.</b> CO <sub>2</sub> emissions - individual heating systems including micro-<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting   | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75  | x<br>x<br>x<br>x<br>x                | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52   | =  <br>=  <br>(263) + (264) =  <br>=  <br>=   | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45  | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)   |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75  | x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52   | =  <br>=  <br>(263) + (264) =  <br>=  <br>=  <br>(265)(271) =   | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)  |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate   | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75  | x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52   | =  <br>=  <br>(263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) =                             | Emissions<br>kg CO₂/year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)   |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75  | x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52   | =  <br>=  <br>(263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) =                             | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)   |
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| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75  | x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52   | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =                                  | Emissions<br>kg CO₂/year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>B   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>] (274)  |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro-   | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75<br>424.75  | x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>Primary factor   | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =                                  | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>84<br>B  | ) (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>(273)<br>(274)   |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75<br>424.75<br>Energy<br>kWh/year  | x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52   | =  <br> (263) + (264) =  <br>=  <br> (265)(271) =  <br> (272) ÷ (4) =                                 | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>84<br>B<br>Primary Energy<br>kWh/year  | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>] (274)  |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro         Space heating - main system 1  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75<br>424.75  | x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>Primary factor   | =  <br> 263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) =                                    | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>84<br>B<br>Primary Energy<br>kWh/year<br>5501.18   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>] (274)<br>] (274)<br>] (261)  |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro         Space heating - main system 1         Water heating  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75<br>424.75<br>Energy<br>kWh/year<br>4509.16<br>2512.73                    | x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52<br>Primary factor<br>1.22<br>1.22   | =  <br> (263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) =  <br> <br>=  <br>=                | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>84<br>B<br>Primary Energy<br>kWh/year<br>5501.18<br>3065.53  | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>] (274)<br>] (274)<br>] (261)<br>] (261)<br>] (264)                                  |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating  | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75<br>424.75<br>424.75<br>Energy<br>kWh/year<br>4509.16<br>2512.73          | x<br>x<br>x<br>x<br>x                | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>Primary factor<br>1.22<br>(261) + (262) +  | =  <br>= (263) + (264) =  <br>=  <br>(265)(271) =  <br>(272) ÷ (4) =  <br> <br>=  <br>(263) + (264) = | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>84<br>B<br>Primary Energy<br>kWh/year<br>5501.18<br>3065.53  | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (272)<br>] (273)<br>] (274)<br>] (274)<br>] (261)<br>] (261)<br>] (265)                       |
| 12a. CO2 emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO2, kg/year         Dwelling CO2 emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans   | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75<br>424.75<br>Energy<br>kWh/year<br>4509.16<br>2512.73                    | x<br>x<br>x<br>x<br>x                | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52<br>Primary factor<br>1.22<br>(261) + (262) +<br>2.22<br>(261) + (262) +<br>3.07 | $ \begin{array}{c}             = \\             = \\         $  | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>84<br>84<br>84<br>B<br>Primary Energy<br>kWh/year<br>5501.18<br>3065.53<br>8566.71<br>230.25                   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (272)<br>] (273)<br>] (274)<br>] (261)<br>] (261)<br>] (264)<br>] (265)<br>] (267)            |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO <sub>2</sub> , kg/year         Dwelling CO <sub>2</sub> emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting                                 | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75           | x<br>x<br>x<br>x<br>x<br>x<br>x<br>x | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52<br>Primary factor<br>1.22<br>(261) + (262) +<br>3.07<br>3.07                    | =   | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>84<br>84<br>84<br>8<br><b>Primary Energy</b><br>kWh/year<br>5501.18<br>3065.53<br>8566.71<br>230.25<br>1303.99 | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (272)<br>] (272)<br>] (273)<br>] (274)<br>] (274)<br>] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)            |
| 12a. CO <sub>2</sub> emissions - individual heating systems including micro-         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Total CO <sub>2</sub> , kg/year         Dwelling CO <sub>2</sub> emission rate         El value         El rating (section 14)         El band         13a. Primary energy - individual heating systems including micro         Space heating - main system 1         Water heating         Space and water heating         Pumps and fans         Electricity for lighting         Primary energy kWh/year | CHP<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75<br>424.75<br>Energy<br>kWh/year<br>4509.16<br>2512.73<br>75.00<br>424.75 | x<br>x<br>x<br>x<br>x<br>x           | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52<br>Primary factor<br>1.22<br>(261) + (262) +<br>3.07<br>3.07                    | =   | Emissions<br>kg CO <sub>2</sub> /year<br>973.98<br>542.75<br>1516.73<br>38.93<br>220.45<br>1776.10<br>16.69<br>84.28<br>84<br>84<br>84<br>84<br>84<br>84<br>84<br>84<br>501.18<br>3065.53<br>8566.71<br>230.25<br>1303.99<br>10100.95              | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (272)<br>] (273)<br>] (274)<br>] (274)<br>] (261)<br>] (264)<br>] (265)<br>] (265)<br>] (267)<br>] (268)<br>] (272) |



| Assessor name                 | Mr John S       | Simpson       |               |               |               |                |           | Assessor nun               | nber           | 3722   |                    |            |
|-------------------------------|-----------------|---------------|---------------|---------------|---------------|----------------|-----------|----------------------------|----------------|--------|--------------------|------------|
| Client                        |                 |               |               |               |               |                |           | Last modified              | ł              | 19/11, | /2014              |            |
| Address                       | Unit 4.01       | Marine Ice    | es Haversto   | ock Hill, Loi | ndon, NW3     | 2BL            |           |                            |                |        |                    |            |
|                               |                 |               |               |               |               |                |           |                            |                |        |                    |            |
| 1. Overall dwelling dimen     | nsions          |               |               |               |               |                |           |                            |                |        |                    |            |
|                               |                 |               |               | A             | area (m²)     |                | Av        | erage storey<br>height (m) | ,              | Vo     | lume (m³)          |            |
| Lowest occupied               |                 |               |               |               | 98.00         | (1a) x         |           | 2.60                       | ] (2a) =       |        | 254.80             | (3a)       |
| Total floor area              | (1a)            | + (1b) + (1   | c) + (1d)(    | 1n) =         | 98.00         | (4)            |           |                            |                |        |                    |            |
| Dwelling volume               |                 |               |               |               |               |                | (3        | a) + (3b) + (3             | sc) + (3d)(3   | n) =   | 254.80             | (5)        |
| 2. Ventilation rate           |                 |               |               |               |               |                |           |                            |                |        |                    |            |
|                               |                 |               |               |               |               |                |           |                            |                | mª     | ' per hour         |            |
| Number of chimneys            |                 |               |               |               |               |                |           | 0                          | x 40 =         |        | 0                  | (6a)       |
| Number of open flues          |                 |               |               |               |               |                |           | 0                          | x 20 =         |        | 0                  | (6b)       |
| Number of intermittent fa     | ns              |               |               |               |               |                |           | 3                          | x 10 =         |        | 30                 | (7a)       |
| Number of passive vents       |                 |               |               |               |               |                |           | 0                          | x 10 =         |        | 0                  | (7b)       |
| Number of flueless gas fire   | 25              |               |               |               |               |                |           | 0                          | x 40 =         |        | 0                  | (7c)       |
|                               |                 |               |               |               |               |                |           |                            |                | Air c  | hanges pe:<br>hour | er         |
| Infiltration due to chimney   | vs, flues, fans | s, PSVs       |               | (6a)          | ) + (6b) + (7 | 'a) + (7b) + ( | (7c) =    | 30                         | ÷ (5) =        |        | 0.12               | (8)        |
| If a pressurisation test has  | been carried    | d out or is i | ntended, p    | roceed to (   | (17), otherv  | vise continu   | e from (9 | ) to (16)                  |                |        |                    |            |
| Air permeability value, q50   | ), expressed    | in cubic m    | etres per h   | our per sq    | uare metre    | of envelop     | e area    |                            |                |        | 5.00               | (17)       |
| If based on air permeabilit   | y value, ther   | n (18) = [(17 | 7) ÷ 20] + (8 | 3), otherwi   | se (18) = (1  | .6)            |           |                            |                |        | 0.37               | (18)       |
| Number of sides on which      | the dwelling    | ; is sheltere | ed            |               |               |                |           |                            |                |        | 2                  | (19)       |
| Shelter factor                |                 |               |               |               |               |                |           | 1                          | - [0.075 x (19 | )] =   | 0.85               | (20)       |
| Infiltration rate incorporat  | ing shelter fa  | actor         |               |               |               |                |           |                            | (18) x (2      | 0) =   | 0.31               | (21)       |
| Infiltration rate modified f  | or monthly v    | vind speed    | :             |               |               |                |           |                            |                |        |                    |            |
| Jan                           | Feb             | Mar           | Apr           | May           | Jun           | Jul            | Aug       | Sep                        | Oct            | Nov    | Dec                |            |
| Monthly average wind spe      | ed from Tab     | le U2         |               |               |               |                |           |                            |                |        |                    | _          |
| 5.10                          | 5.00            | 4.90          | 4.40          | 4.30          | 3.80          | 3.80           | 3.70      | 4.00                       | 4.30           | 4.50   | 4.70               | (22)       |
| Wind factor (22)m ÷ 4         | _               |               |               |               | - <b>.</b>    |                |           |                            |                |        |                    | _          |
| 1.28                          | 1.25            | 1.23          | 1.10          | 1.08          | 0.95          | 0.95           | 0.93      | 1.00                       | 1.08           | 1.13   | 1.18               | (22a)      |
| Adjusted infiltration rate (a | allowing for s  | shelter and   | l wind facto  | or) (21) x (2 | 22a)m         | -              |           |                            |                |        |                    | _          |
| 0.40                          | 0.39            | 0.38          | 0.34          | 0.34          | 0.30          | 0.30           | 0.29      | 0.31                       | 0.34           | 0.35   | 0.37               | (22b)      |
| Calculate effective air char  | nge rate for t  | he applica    | ble case:     |               |               |                |           |                            |                |        |                    | _          |
| If mechanical ventilatio      | n: air change   | e rate throu  | ugh system    |               |               |                |           |                            |                |        | N/A                | (23a)      |
| If balanced with heat re      | ecovery: effic  | ciency in %   | allowing fo   | or in-use fa  | ictor from T  | Fable 4h       |           |                            |                |        | N/A                | (23c)      |
| d) natural ventilation o      | r whole hous    | se positive   | input venti   | lation fror   | n loft        | -              | 1 -       |                            | 1              |        | <del></del>        | <b>-</b> , |
| 0.58                          | 0.58            | 0.57          | 0.56          | 0.56          | 0.54          | 0.54           | 0.54      | 0.55                       | 0.56           | 0.56   | 0.57               | (24d)      |
| Effective air change rate -   | enter (24a) c   | or (24b) or   | (24c) or (24  | 1d) in (25)   |               |                |           |                            | 1 1            |        |                    |            |
| 0.58                          | 0.58            | 0.57          | 0.56          | 0.56          | 0.54          | 0.54           | 0.54      | 0.55                       | 0.56           | 0.56   | 0.57               | (25)       |



| Element   |  |  |   |   |   |   |   |   |  |   |  |   |  |
|---|--|--|---|---|---|---|---|---|--|---|--|---|--|
|   |  |  | а   | Gross<br>rea, m²  | Openings<br>m <sup>2</sup>  | Net<br>A,   | area<br>m²  | U-value<br>W/m²K  | A x U W                                  | /К к-\<br>kJ,   | /alue,<br>/m².K                                    | Ахк,<br>kJ/K  |  |
| Window  |  |  |   |   |   | 22  | .35 x   | 1.33  | = 29.63                                  |   |  |   | (27)   |
| Door  |  |  |   |   |   | 2.  | 14 x  | 1.00  | = 2.14                                   |   |  |   | (26)   |
| External wall   |  |  |   |   |   | 86  | .79 x   | 0.18  | = 15.62                                  |   |  |   | (29a)  |
| Roof  |  |  |   |   |   | 98  | .00 x   | 0.13  | = 12.74                                  |   |  |   | (30)   |
| Total area of ext   | ernal eleme  | ents ∑A, m²  | 2   |   |   | 209   | 0.28  |   |  |   |  |   | (31)   |
| Fabric heat loss,   | W/K = ∑(A :  | × U)   |   |   |   |   |   |   | (20                                      | 5)(30) + (3   | 32) =  | 60.13   | (33)   |
| Heat capacity Cr  | m = ∑(А x к)   |  |   |   |   |   |   | (28)  | (30) + (32)                              | + (32a)(3   | 2e) =  | N/A   | (34)   |
| Thermal mass p  | arameter (T  | MP) in kJ/r  | m²K   |   |   |   |   |   |  |   |  | 250.00  | (35)   |
| Thermal bridges   | : Σ(L x Ψ) ca  | lculated us  | sing Appen  | dix K   |   |   |   |   |  |   |  | 10.03   | (36)   |
| Total fabric heat   | loss   |  |   |   |   |   |   |   |  | (33) + (3   | 36) =  | 70.16   | (37)   |
|   | Jan  | Feb  | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep                                      | Oct   | Nov  | Dec   |  |
| Ventilation heat  | loss calcula   | ted month  | ily 0.33 x (2   | 25)m x (5)  |   |   |   |   |  |   |  |   |  |
|   | 48.72  | 48.46  | 48.21   | 47.01   | 46.79   | 45.75   | 45.75   | 45.56   | 46.15                                    | 46.79   | 47.24  | 47.71   | (38)   |
| Heat transfer co  | efficient, W   | /K (37)m +   | + (38)m   |   | I I   |   |   | 1   | 1  |   |  | 1   | _ • •  |
|   | 118.88   | 118.62   | 118.37  | 117.17  | 116.95  | 115.91  | 115.91  | 115.72  | 116.31                                   | 116.95  | 117.40   | 117.87  | 7  |
|   |  |  |   |   | II  |   |   |   | Average = 5                              | 5(39)112/   | /12 =  | 117.17  | _<br>] (39)  |
| Heat loss param   | eter (HLP), V  | W/m²K (39  | 9)m ÷ (4)   |   |   |   |   |   |  |   |  |   |  |
| ·   | 1.21   | 1.21   | 1.21  | 1.20  | 1.19  | 1.18  | 1.18  | 1.18  | 1.19                                     | 1.19  | 1.20   | 1.20  | 7  |
|   |  |  |   |   |   |   |   |   | Average = 5                              | 5(40)112/   | /12 =  | 1.20  | _<br>] (40)  |
| Number of days  | in month (T  | able 1a)   |   |   |   |   |   |   |  | _( -, ,   |  | -   |  |
| ,   | 31.00  | 28.00  | 31.00   | 30.00   | 31.00   | 30.00   | 31.00   | 31.00   | 30.00                                    | 31.00   | 30.00  | 31.00   | (40)   |
|   |  |  |   |   |   |   |   |   |  |   |  |   |  |
| 4. Water heati  | ng energy re   | equiremen  | t   |   |   |   |   |   |  |   |  |   |  |
| Assumed occupa  | ancy, N  |  |   |   |   |   |   |   |  |   |  |   | -  |
| Annual average  |  |  |   |   |   |   |   |   |  |   |  | 2.72  | (42)   |
|   | hot water u  | sage in litr   | es per day  | Vd,average  | = (25 x N) +  | 36  |   |   |  |   |  | 2.72<br>98.81   | (42)<br>(43)   |
|   | hot water u<br>Jan   | sage in litro<br><b>Feb</b>  | es per day<br><b>Mar</b>  | Vd,average<br><b>Apr</b>  | = (25 x N) +<br>May   | 36<br>Jun   | Jul   | Aug   | Sep                                      | Oct   | Nov  | 2.72<br>98.81<br>Dec  | _ (42)<br>_ (43)   |
| Hot water usage   | hot water u<br>Jan<br>e in litres per  | sage in litro<br><b>Feb</b><br>r day for ea  | es per day<br><b>Mar</b><br>ach month   | Vd,average<br><b>Apr</b><br>Vd,m = fact   | = (25 x N) +<br><b>May</b><br>or from Tab   | 36<br><b>Jun</b><br>le 1c x (43   | Jul<br>)  | Aug   | Sep                                      | Oct   | Nov  | 2.72<br>98.81<br>Dec  | _ (42)<br>] (43)   |
| Hot water usage   | hot water u<br>Jan<br>e in litres pe<br>108.69   | sage in litre<br><b>Feb</b><br>r day for ea<br>104.73  | es per day<br>Mar<br>ach month<br>100.78  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83  | = (25 x N) +<br><b>May</b><br>for from Tab  | 36<br>Jun<br>le 1c x (43<br>88.92   | Jul<br>)<br>88.92   | Aug<br>92.88  | <b>Sep</b><br>96.83                      | <b>Oct</b> 100.78   | Nov  | 2.72<br>98.81<br>Dec<br>108.69  | _ (42)<br>] (43)   |
| Hot water usage   | hot water u<br>Jan<br>e in litres pe<br>108.69   | sage in litre<br><b>Feb</b><br>r day for ea<br>104.73  | es per day<br>Mar<br>ach month<br>100.78  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83  | = (25 x N) +<br>May<br>for from Tab   | 36<br>Jun<br>le 1c x (43<br>88.92   | Jul<br>)<br>88.92   | Aug<br>92.88  | <b>Sep</b><br>96.83                      | <b>Oct</b><br>100.78<br>Σ(44)1                              | Nov  | 2.72<br>98.81<br>Dec<br>108.69  | _ (42)<br>] (43)<br>] (44)   |
| Hot water usage<br>Energy content   | hot water u<br>Jan<br>e in litres per<br>108.69  | sage in litre<br>Feb<br>r day for ea<br>104.73<br>r used = 4.2   | es per day<br>Mar<br>ach month<br>100.78  | Vd,average<br>Apr<br>Vd,m = fact<br>96.83   | = (25 x N) +<br><b>May</b><br>for from Tab<br>92.88<br>8600 kWh/m   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see  | Jul<br>)<br>88.92<br>Tables 1b,   | Aug<br>92.88<br>1c 1d)  | <b>Sep</b><br>96.83                      | <b>Oct</b><br>100.78<br>Σ(44)1                              | Nov  | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66   | ] (42)<br>] (43)<br>] (44)   |
| Hot water usage<br>Energy content   | hot water u<br>Jan<br>e in litres per<br>108.69<br>of hot water<br>161.18  | sage in litre<br>Feb<br>r day for ea<br>104.73<br>r used = 4.2<br>140.97   | es per day<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>mm x Tm/3<br>126.82   | = (25 x N) +<br><b>May</b><br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30  | Aug<br>92.88<br>1c 1d)<br>111.66  | Sep<br>96.83<br>112.99                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68                    | Nov<br>104.73<br>.12 =                             | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>156.09   | ] (42)<br>] (43)<br>] (44)   |
| Hot water usage<br>Energy content   | hot water u<br>Jan<br>e in litres per<br>108.69<br>of hot water<br>161.18  | sage in litre<br>Feb<br>r day for ea<br>104.73<br>r used = 4.1<br>140.97   | es per day<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>: nm x Tm/3<br>126.82   | = (25 x N) +<br><b>May</b><br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30  | Aug<br>92.88<br>1c 1d)<br>111.66  | Sep<br>96.83<br>112.99                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1          | Nov 104.73 .12 =                                   | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59  | ] (42)<br>] (43)<br>] (44)<br>] (45)   |
| Hot water usage<br>Energy content<br>Distribution loss  | hot water u<br>Jan<br>e in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)   | sage in litre<br>Feb<br>r day for ea<br>104.73<br>r used = 4.2<br>140.97<br>m  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30  | Aug<br>92.88<br>1c 1d)<br>111.66  | Sep<br>96.83<br>112.99                   | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1          | Nov<br>104.73<br>.12 =<br>143.74<br>.12 =          | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59  | (42)<br>(43)<br>(43)<br>(44)<br>(44)   |
| Hot water usage<br>Energy content<br>Distribution loss  | hot water u<br>Jan<br>in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18  | sage in litre<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4.1<br>140.97<br>m<br>21.15  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>: nm x Tm/3<br>126.82<br>19.02  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25   | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66  | Sep<br>96.83<br>112.99<br>16.95          | Oct<br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75        | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41   | ) (42)<br>) (43)<br>) (44)<br>) (44)<br>) (45)<br>) (46)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume  | hot water u<br>Jan<br>e in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu  | sage in litre<br>Feb<br>r day for ea<br>104.73<br>r used = 4.2<br>140.97<br>m<br>21.15<br>rding any so   | es per day '<br>Mar<br>ach month<br>100.78<br>18 × Vd,m ×<br>145.47<br>21.82<br>olar or WW  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>nm x Tm/3<br>126.82<br>19.02<br>/HRS storag   | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>te within sam                                  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95          | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75 | Nov<br>104.73<br>.12 =<br>143.74<br>.12 =<br>21.56 | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00   | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo  | hot water u<br>Jan<br>e in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu  | sage in litre<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4.2<br>140.97<br>m<br>21.15<br>ding any so   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>: nm x Tm/3<br>126.82<br>19.02<br>/HRS storage  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25<br>re within sam                                  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95          | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75 | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00   | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur  | hot water u<br>Jan<br>e in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) incluoss:<br>er's declare  | sage in litre<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4.2<br>140.97<br>m<br>21.15<br>ding any so<br>d loss factor  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>19.02<br>/HRS storage<br>(kWh/day)  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>te within sam                                  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95          | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75 | Nov 104.73 .12 = :                                 | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.39   | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature   | hot water u<br>Jan<br>e in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>e factor from   | sage in litre<br><b>Feb</b><br>r day for ea<br>104.73<br>r used = 4.2<br>140.97<br>m<br>21.15<br>rding any se<br>d loss factor<br>n Table 2b   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW  | Vd,average<br>Apr<br>Vd,m = fact<br>96.83<br>mm x Tm/3<br>126.82<br>19.02<br>/HRS storage<br>(kWh/day)  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25<br>re within sam                                  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95          | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75 | Nov 104.73 .12 = :                                 | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.39<br>0.54                                   | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(49)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi   | hot water u<br>Jan<br>e in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>e factor from<br>rom water s  | sage in litre           Feb           r day for ea           104.73           r used = 4           140.97           m           21.15           iding any so           d loss factor           n Table 2b           torage (kW)  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>/h/day) (48  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>19.02<br>/HRS storage<br>(kWh/day)<br>3) x (49)   | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>re within sam                                  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95          | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75 | Nov 104.73 .12 = :                                 | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.39<br>0.54<br>0.75                           | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(49)<br>(50)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54  | hot water u<br>Jan<br>in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>e factor from<br>rom water s  | sage in litre<br>Feb<br>r day for ea<br>104.73<br>r used = 4.2<br>140.97<br>m<br>21.15<br>d loss facto<br>n Table 2b<br>torage (kW   | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>/h/day) (48  | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>(hrs storage<br>(kWh/day)<br>3) x (49)  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>te within sam                                  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br><u>15.75</u><br>ne vessel                           | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95          | <b>Oct</b><br>100.78<br>Σ(44)1<br>131.68<br>Σ(45)1<br>19.75 | Nov 104.73 .12 = 143.74 .12 = 21.56                | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.39<br>0.54<br>0.75<br>0.75                   | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54  | hot water u<br>Jan<br>in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>e factor from<br>rom water s<br>0 in (55)<br>oss calculate                                    | sage in litre<br>Feb<br>r day for ea<br>104.73<br>r used = 4.1<br>140.97<br>m<br>21.15<br>ding any so<br>d loss facto<br>n Table 2b<br>torage (kW  | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>/h/day) (48<br>month (55                                   | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>(hRS storage<br>(kWh/day)<br>3) x (49)<br>5) x (41)m  | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25<br>re within sam                                  | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75   | Sep<br>96.83<br>112.99<br>16.95          | <b>Oct</b> 100.78 Σ(44)1 131.68 Σ(45)1 19.75                | Nov 104.73 12 = :                                  | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.39<br>0.54<br>0.75<br>0.75                   | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54<br>Water storage lo                      | hot water u<br>Jan<br>in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>e factor from<br>rom water s<br>e) in (55)<br>oss calculate<br>23.33                          | sage in litre           Feb           r day for ea           104.73           r used = 4.2           140.97           m           21.15           iding any so           d loss factor           n Table 2b           torage (kW)           ed for each           21.07                        | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>/h/day) (48<br>month (59<br>23.33                          | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>(19.02<br>/HRS storage<br>(kWh/day)<br>3) x (49)<br>5) x (41)m<br>22.58                         | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>re within sam<br>23.33                         | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel                                  | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60   | Aug 92.88 1c 1d) 111.66 16.75 23.33   | Sep<br>96.83<br>112.99<br>16.95<br>22.58 | <b>Oct</b> 100.78 Σ(44)1 131.68 Σ(45)1 19.75                | Nov 104.73 .12 = 143.74 .12 = 21.56 22.58          | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.39<br>0.54<br>0.75<br>0.75<br>23.33          | ) (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)<br>(55)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54<br>Water storage lo<br>If the vessel con | hot water u<br>Jan<br>in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>e factor from<br>rom water s<br>a) in (55)<br>oss calculate<br>23.33<br>tains dedica          | sage in litre           Feb           r day for ea           104.73           r used = 4.1           140.97           m           21.15           iding any so           d loss factor           n Table 2b           torage (kW)           ed for each           21.07           ited solar s | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>/h/day) (48<br>month (59<br>23.33<br>itorage or c          | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>(19.02<br>/HRS storage<br>(kWh/day)<br>8) x (49)<br>5) x (41)m<br>22.58<br>ledicated W          | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>8600 kWh/m<br>121.69<br>18.25<br>re within sam<br>23.33<br>/WHRS (56)r          | 36<br>Jun<br>le 1c x (43<br>88.92<br>000000000000000000000000000000000000                                       | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60<br>14.60<br>23.33<br>Vs] ÷ (47),          | Aug 92.88 1c 1d) 111.66 16.75 23.33 else (56)                                     | Sep<br>96.83<br>112.99<br>16.95<br>22.58 | <b>Oct</b> 100.78 Σ(44)1 131.68 Σ(45)1 19.75 23.33          | Nov 104.73 12 = :                                  | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.39<br>0.54<br>0.75<br>0.75<br>0.75           | (42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)<br>(55)   |
| Hot water usage<br>Energy content<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur<br>Temperature<br>Energy lost fi<br>Enter (50) or (54<br>Water storage lo<br>If the vessel con | hot water u<br>Jan<br>in litres per<br>108.69<br>of hot water<br>161.18<br>0.15 x (45)<br>24.18<br>(litres) inclu<br>oss:<br>er's declare<br>e factor from<br>rom water s<br>e) in (55)<br>oss calculate<br>23.33<br>tains dedica<br>23.33 | sage in litre         Feb         r day for ea         104.73         r used = 4.2         140.97         m         21.15         rding any so         d loss factor         n Table 2b         torage (kW)         ed for each         21.07         ited solar s         21.07               | es per day '<br>Mar<br>ach month<br>100.78<br>18 x Vd,m x<br>145.47<br>21.82<br>olar or WW<br>or is known<br>/h/day) (48<br>month (59<br>23.33<br>itorage or c<br>23.33 | Vd,average<br><b>Apr</b><br>Vd,m = fact<br>96.83<br>anm x Tm/3<br>126.82<br>(19.02<br>/HRS storage<br>(kWh/day)<br>3) x (49)<br>5) x (41)m<br>22.58<br>ledicated W<br>22.58 | = (25 x N) +<br>May<br>for from Tab<br>92.88<br>3600 kWh/m<br>121.69<br>18.25<br>re within sam<br>23.33<br>/WHRS (56)r<br>23.33 | 36<br>Jun<br>le 1c x (43<br>88.92<br>onth (see<br>105.01<br>15.75<br>ne vessel<br>22.58<br>n x [(47) -<br>22.58 | Jul<br>)<br>88.92<br>Tables 1b,<br>97.30<br>14.60<br>14.60<br>23.33<br>Vs] ÷ (47),<br>23.33 | Aug<br>92.88<br>1c 1d)<br>111.66<br>16.75<br>16.75<br>23.33<br>else (56)<br>23.33 | Sep<br>96.83<br>112.99<br>16.95<br>22.58 | <b>Oct</b> 100.78 Σ(44)1 131.68 Σ(45)1 19.75 23.33          | Nov 104.73 12 = 143.74 12 = 21.56 22.58 22.58      | 2.72<br>98.81<br>Dec<br>108.69<br>1185.66<br>1554.59<br>23.41<br>150.00<br>1.39<br>0.54<br>0.75<br>0.75<br>23.33<br>23.33 | <ul> <li>(42)</li> <li>(43)</li> <li>(43)</li> <li>(44)</li> <li>(45)</li> <li>(45)</li> <li>(46)</li> <li>(47)</li> <li>(47)</li> <li>(48)</li> <li>(49)</li> <li>(50)</li> <li>(55)</li> <li>(56)</li> <li>(57)</li> </ul> |

|  | 22.20   | 21.01  | 22.20   | 22 51  | 22.20   | 22 51  | 22.20   | 22.20  | 22.51   | 22.20  | 22.54  | 22.26   |  |
|--|---|--|---|--|---|--|---|--|---|--|--|---|--|
|  | 23.20   | 21.01  | 23.20   | 22.51  | 23.26   | 22.51  | 23.20   | 23.20  | 22.51   | 23.20  | 22.51  | 23.20 (   | 59)  |
| Combi loss for e   | each month  | from Table   | e 3a, 3b or 3   | с  |   |  |   |  |   |  |  |   |  |
|  | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00   | 0.00 (  | 61)  |
| Total heat requ  | ired for wat  | er heating   | calculated f  | or each mo   | onth 0.85 x   | (45)m + (46  | 6)m + (57)r   | n + (59)m  | + (61)m   |  |  |   |  |
|  | 207.77  | 183.05   | 192.06  | 171.91   | 168.28  | 150.10   | 143.90  | 158.25   | 158.08  | 178.28   | 188.83   | 202.69 (  | 62)  |
| Solar DHW inpu   | t calculated  | l using App  | endix G or A  | Appendix H   |   |  |   |  | •   | •  |  |   |  |
|  | 0.00  |  | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00   | 0.00 (  | 63)  |
|  |   | 0.00   |   | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00   | 0.00  | 03)  |
| Output from wa   | iter neater i   | ror each mo  | onth (KWN/I   | month) (62   | 2)m + (63)m<br>1  | 1<br>  |   |  |   |  |  |   |  |
|  | 207.77  | 183.05   | 192.06  | 171.91   | 168.28  | 150.10   | 143.90  | 158.25   | 158.08  | 178.28   | 188.83   | 202.69  |  |
|  |   |  |   |  |   |  |   |  |   | ∑(64)1   | .12 =  | 2103.21 (   | 64)  |
| Heat gains from  | water heat  | ting (kWh/r  | month) 0.25   | 5 × [0.85 ×  | (45)m + (61   | .)m] + 0.8 ×   | [(46)m + (5   | 57)m + (59   | 9)m]  |  |  |   |  |
|  | 90.87   | 80.54  | 85.64   | 78.24  | 77.74   | 70.99  | 69.63   | 74.40  | 73.64   | 81.06  | 83.87  | 89.18 (   | 65)  |
|  |   | 1  |   |  | 1   |  |   |  |   |  | 1  | · · · ·   |  |
| 5. Internal gai  | ns  |  |   |  |   |  |   |  |   |  |  |   |  |
|  | Jan   | Feb  | Mar   | Apr  | May   | Jun  | Jul   | Aug  | Sep   | Oct  | Nov  | Dec   |  |
| Metabolic gains  | (Table 5)   |  |   | -  | -   |  |   | -  |   |  |  |   |  |
| inclusione guine   |   | 120.01   | 120.01  | 120.01   | 120.01  | 120.01   | 120.01  | 120.01   | 120.01  | 120.01   | 120.01   | 120.01  |  |
|  | 136.01  | 136.01   | 136.01  | 136.01   | 136.01  | 136.01   | 136.01  | 136.01   | 136.01  | 136.01   | 136.01   | 136.01 (  | 66)  |
| Lighting gains (   | alculated in  | n Appendix   | L, equation   | L9 or L9a),  | , also see Ta   | ible 5   |   |  |   | <b>.</b>   |  |   |  |
|  | 22.56   | 20.04  | 16.30   | 12.34  | 9.22  | 7.79   | 8.41  | 10.93  | 14.68   | 18.64  | 21.75  | 23.19 (   | 67)  |
| Appliance gains  | (calculated   | in Append  | ix L, equatio   | on L13 or L  | 13a), also se   | ee Table 5   |   |  |   |  |  |   |  |
|  | 253.05  | 255.68   | 249.06  | 234.97   | 217.19  | 200.48   | 189.31  | 186.69   | 193.31  | 207.39   | 225.17   | 241.89 (  | 68)  |
| Cooking gains (  | calculated in   | n Appendix   | L, equation   | L15 or L15   | ;<br>ja), also see  | Table 5  |   |  |   | •  |  | · · · · · ·   |  |
| 0.01   | 26.60   | 26.60  | 26.60   | 26.60  | 26.60   | 26.60  | 26.60   | 26.60  | 26.60   | 26.60  | 26.60  | 26.60 (   | 60)  |
| Duran and fam.   | <u> </u>  | 50.00  | 50.00   | 50.00  | 50.00   | 50.00  | 50.00   | 50.00  | 50.00   | 50.00  | 50.00  | 50.00 (   | [69]   |
| Pump and fan g   | ains (Table   | 5a)  | 1   | 1  | 1   |  |   |  | -   | 1  | 1  |   |  |
|  | 2 00  |  | 2 00  | 2 00   |   | 2 00   | 2 00  | 2 00   | 2.00  | 2 00   | 2 00   | 0.00  |  |
|  | 3.00  | 3.00   | 3.00  | 3.00   | 3.00  | 3.00   | 3.00  | 5.00   | 3.00  | 3.00   | 3.00   | 3.00 (  | 70)  |
| Losses e.g. evap   | oration (Ta   | 3.00<br>ble 5)   | 3.00  | 3.00   | 3.00  | 3.00   | 3.00  | 5.00   | 3.00  | 3.00   | 3.00   | 3.00 (  | 70)  |
| Losses e.g. evar   | oration (Ta   | 3.00<br>ble 5)   | -108.81   | -108.81  | 3.00  | -108.81  | -108.81   | -108.81  | -108.81   | -108.81  | -108.81  | -108.81 (   | 70)<br>71)   |
| Losses e.g. evap<br>Water heating g  | ooration (Ta<br>-108.81<br>gains (Table   | 3.00<br>ble 5)<br>-108.81<br>5)  | -108.81   | -108.81  | 3.00  | -108.81  | -108.81   | -108.81  | -108.81   | -108.81  | -108.81  | 3.00 (  | 70)<br>71)   |
| Losses e.g. evap<br>Water heating g  | 3.00<br>poration (Ta<br>-108.81<br>gains (Table   | 3.00<br>ble 5)<br>-108.81<br>5)  | -108.81   | -108.81  | 3.00  | 3.00<br>-108.81  | 3.00<br>-108.81   | -108.81  | -108.81   | -108.81  | -108.81  | 3.00 (  | 70)<br>71)<br>72)  |
| Losses e.g. evap   | 2.100<br>poration (Ta<br>-108.81<br>gains (Table<br>122.13  | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85  | -108.81<br>115.11   | -108.81<br>108.67  | 3.00<br>-108.81<br>104.49   | 3.00<br>-108.81<br>98.59   | -108.81<br>93.59  | -108.81  | -108.81   | -108.81<br>108.95  | -108.81<br>116.48  | 3.00 (<br>-108.81 (<br>119.86 (   | 70)<br>71)<br>72)  |
| Losses e.g. evap<br>Water heating g<br>Total internal g  | 2.100<br>2007ation (Ta<br>-108.81<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (i  | -108.81<br>115.11<br>68)m + (69)  | 3.00<br>-108.81<br>108.67<br>m + (70)m   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7   | 3.00<br>-108.81<br>98.59<br>72)m   | 3.00<br>-108.81<br>93.59  | -108.81  | -108.81<br>102.28   | -108.81<br>108.95  | 3.00<br>-108.81<br>116.48  | 3.00 (<br>-108.81 (<br>119.86 (   | 70)<br>71)<br>72)  |
| Losses e.g. evap<br>Water heating g<br>Total internal g  | 2.100<br>2.108.81<br>2.108.81<br>2.13<br>2.13<br>2.13<br>2.13<br>2.13<br>2.15<br>2.15<br>2.15<br>2.15<br>2.15<br>2.15<br>2.15<br>2.15   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (i<br>462.37  | -108.81<br>115.11<br>68)m + (69)<br>447.27  | -108.81<br>108.67<br>m + (70)m<br>422.78   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66   | 3.00<br>-108.81<br>93.59<br>358.12  | -108.81<br>100.00<br>364.43  | 3.00<br>-108.81<br>102.28<br>377.07   | -108.81<br>108.95<br>401.78  | 3.00<br>-108.81<br>116.48<br>430.21  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (   | 70)<br>71)<br>72)<br>73)   |
| Losses e.g. evap<br>Water heating g<br>Total internal g  | 2.100<br>poration (Ta<br>-108.81<br>gains (Table<br>122.13<br>ains (66)m<br>464.55  | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (1<br>462.37  | -108.81<br>115.11<br>68)m + (69)<br>447.27  | -108.81<br>108.67<br>m + (70)m<br>422.78   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66   | 3.00<br>-108.81<br>93.59<br>358.12  | -108.81<br>100.00<br>364.43  | 3.00<br>-108.81<br>102.28<br>377.07   | -108.81<br>108.95<br>401.78  | -108.81<br>116.48<br>430.21  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (   | 70)<br>71)<br>72)<br>73)   |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains  | 2.100<br>2007ation (Ta<br>-108.81<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37  | -108.81<br>115.11<br>68)m + (69)<br>447.27  | 3.00<br>-108.81<br>108.67<br>m + (70)m<br>422.78   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66   | 3.00<br>-108.81<br>93.59<br>358.12  | -108.81<br>100.00<br>364.43  | -108.81<br>102.28<br>377.07   | -108.81<br>108.95<br>401.78  | 3.00<br>-108.81<br>116.48<br>430.21  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (   | 70)<br>71)<br>72)<br>73)   |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains  | 2.100<br>2007ation (Ta<br>-108.81<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37  | -108.81<br>-108.81<br>115.11<br>68)m + (69)<br>447.27<br>Access f   | -108.81<br>108.67<br>m + (70)m<br>422.78   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup>   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola   | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux   | -108.81<br>100.00<br>364.43  | -108.81<br>102.28<br>377.07   | -108.81<br>-108.95<br>401.78   | -108.81<br>116.48<br>430.21  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains  | 70)<br>71)<br>72)<br>73)   |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains  | 2.100<br>2007ation (Ta<br>-108.81<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37  | -108.81<br>-108.81<br>115.11<br>68)m + (69)<br>447.27<br>Access f<br>Table  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup>   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W  | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup>   | -108.81<br>100.00<br>364.43<br>spe   | 3.00<br>-108.81<br>102.28<br>377.07<br>g<br>cific data<br>Table 6b  | -108.81<br>-108.95<br>108.95<br>401.78<br>FF<br>specific c<br>or Table   | -108.81<br>116.48<br>430.21  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W   | 70)<br>71)<br>72)<br>73)   |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains  | 2.100<br>2007ation (Ta<br>-108.81<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30<br>30   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37  | -108.81<br>-108.81<br>115.11<br>68)m + (69)<br>447.27<br>Access f<br>Table  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup>   | -108.81<br>98.59<br>72)m<br>373.66<br>Sola   | -108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup>   | -108.81<br>100.00<br>364.43<br>spe<br>or   | -108.81<br>102.28<br>377.07<br>g<br>cific data<br>Table 6b  | -108.81<br>-108.95<br>401.78<br>FF<br>specific c<br>or Table   | -108.81<br>116.48<br>430.21  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W   | 70)<br>71)<br>72)<br>73)   |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains  | 3.00<br>poration (Ta<br>-108.81<br>gains (Table<br>122.13<br>ains (66)m<br>464.55   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (1<br>462.37  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> </ul>   | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66  | -108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup>   | -108.81<br>100.00<br>364.43<br>spe<br>or<br>0.9 x  | <ul> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>g<br/>cific data<br/>Table 6b</li> <li>0.63</li> </ul>  | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> </ul>  | -108.81<br>116.48<br>430.21  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (  | 70)<br>71)<br>72)<br>73)<br>77)  |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South  | 3.00<br>poration (Ta<br>-108.81<br>gains (Table<br>122.13<br>ains (66)m -<br>464.55   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)m</li> <li>447.27</li> <li>Access f</li> <li>Table</li> <li>0.7</li> <li>0.7</li> </ul>  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x [   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66<br>X<br>373.66   | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x   | -108.81<br>100.00<br>364.43<br>spe<br>or<br>0.9 x<br>0.9 x   | <ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>g<br/>cific data<br/>Table 6b</li> <li>0.63</li> <li>2</li> </ul>   | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> </ul>  | -108.81<br>116.48<br>430.21  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (   | 70)<br>71)<br>72)<br>73)<br>77)<br>78)   |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast   | 2.100<br>00ration (Ta<br>-108.81<br>gains (Table<br>122.13<br>ains (66)m<br>464.55  | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)n</li> <li>447.27</li> <li>447.27</li> <li>Access f</li> <li>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> </ul>   | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x [<br>7 x [  | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66<br>X<br>4<br>X<br>4<br>X<br>1  | -108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x   |  | <ul> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>g<br/>cific data<br/>Table 6b</li> <li>0.63</li> <li>2</li> </ul>   | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> </ul>  | -108.81<br>-108.81<br>116.48<br>430.21<br>data<br>6c<br>= [<br>= [<br>= [<br>= [   | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (<br>14.97 (  | 70)<br>71)<br>72)<br>73)<br>77)<br>78)<br>75)  |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest  | 2.00<br>poration (Ta<br>-108.81<br>gains (Table<br>122.13<br>ains (66)m<br>464.55   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (1<br>462.37  | 3.00<br>  -108.81<br>  115.11<br>  68)m + (69)n<br>  447.27<br>  447.27<br>  Access f<br>  Table<br>  0.7<br>  0.7<br>  0.7<br>  0.7  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>Factor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [  | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66<br>X<br>373.66<br>X<br>1<br>X<br>1<br>X<br>1<br>X<br>1   | -108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x   |  | <ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>8</li> <li>cific data</li> <li>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>2</li> <li>3</li> </ul>   | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> </ul>                                | 3.00<br>-108.81<br>116.48<br>430.21<br>430.21<br>56c<br>= [<br>= [<br>= [<br>= [<br>= [<br>= [   | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (<br>14.97 (<br>16.03 (   | <ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>73)</li> <li>75)</li> <li>81)</li> </ul>  |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w  | 2.13<br>ains (Table<br>122.13<br>ains (66)m -<br>464.55<br>464.55   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)n</li> <li>447.27</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> </ul>  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [<br>7 x [   | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66<br>X<br>1<br>x 30<br>X | -108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x                                       | -108.81<br>100.00<br>364.43<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x  | <ul> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>g<br/>cific data<br/>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>2</li> </ul>   | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> </ul>                                | -108.81<br>-108.81<br>116.48<br>430.21<br>data<br>e 6c<br>= [<br>= [<br>= [<br>= [<br>= [  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (<br>14.97 (<br>16.03 (   | <ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>73)</li> <li>75)</li> <li>81)</li> </ul>  |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w  | atts Σ(74)m   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37<br>462.37  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)n</li> <li>447.27</li> <li>Access f</li> <li>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>480.70</li> </ul>  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>V<br>373.66<br>V<br>1<br>x 3<br>x 4<br>x 1<br>x 1<br>x 1<br>x 1<br>x 1   | -108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>1.28 x                             | -108.81<br>100.00<br>364.43<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x   | -108.81<br>102.28<br>377.07<br>g<br>cific data<br>Table 6b<br>0.63<br>:<br>0.63<br>:<br>0.63<br>:<br>530.59   | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> </ul>                              | 3.00<br>-108.81<br>116.48<br>430.21<br>data<br>e 6c<br>= [<br>= [<br>= [<br>= [<br>] = [<br>] = [<br>] = [   | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>67.01 (<br>14.97 (<br>16.03 (<br>166.65 (  | <ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>77)</li> <li>78)</li> <li>75)</li> <li>81)</li> <li>83)</li> </ul>              |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w   | atts Σ(74)m<br>195.50   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (r<br>462.37<br>462.37  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)m</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>480.70</li> <li>+ (83)m</li> </ul>  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65<br>730.96   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66<br>X<br>1<br>x 1<br>x 1<br>x 1<br>739.07   | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>1.28 x                     | <pre>-108.81 100.00 364.43 spe or 0.9 x 0.9 x 0.9 x 0.9 x 0.9 x 626.49</pre>   | <ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>377.07</li> <li>8</li> <li>cific data</li> <li>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>2</li> <li>30.63</li> <li>2</li> <li>530.59</li> </ul>  | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> </ul>                | 3.00<br>-108.81<br>116.48<br>430.21<br>430.21<br>430.21<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5<br>5   | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (<br>14.97 (<br>16.03 (<br>166.65 (   | <ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>73)</li> <li>75)</li> <li>81)</li> <li>83)</li> </ul>                           |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int                                     | atts Σ(74)m<br>195.50<br>2007<br>108.81<br>300<br>122.13<br>300<br>464.55<br>122.13<br>300<br>464.55<br>122.13<br>300<br>464.55<br>122.13<br>300<br>464.55<br>122.13<br>300<br>464.55<br>122.13<br>300<br>464.55<br>122.13<br>300<br>464.55<br>122.13<br>300<br>464.55<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.13<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.15<br>122.1 | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37<br>462.37  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)n</li> <li>447.27</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>1.7</li> <li>0.7</li> <li>480.70</li> <li>+ (83)m</li> <li>0.32.07</li> </ul>  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65<br>730.96   | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66<br>X<br>1<br>X<br>1<br>X<br>1<br>X<br>1<br>X<br>1<br>739.07  | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>706.93                     | -108.81<br>100.00<br>364.43<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x<br>0.9 x  | <ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>g<br/>cific data<br/>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>2</li> <li>30.59</li> </ul>  | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> </ul>                              | $\begin{array}{c} 3.00 \\ \hline 3.00 $ | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (<br>14.97 (<br>16.03 (<br>166.65 (   | <ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>73)</li> <li>75)</li> <li>81)</li> <li>83)</li> <li>24)</li> </ul>              |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int                                     | (-108.81)<br>gains (Table<br>(122.13)<br>ains (66)m<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(466.05)<br>(466.05)   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (1<br>462.37<br>462.37<br>(82)m<br>338.91<br>blar (73)m +<br>801.28   | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)</li> <li>447.27</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>480.70</li> <li>+ (83)m</li> <li>927.97</li> </ul>  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65<br>730.96<br>1128.66  | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>X<br>3<br>X<br>4<br>X<br>1<br>X<br>1<br>X<br>1<br>739.07<br>1112.73  | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>706.93<br>1065.05          | -108.81<br>100.00<br>364.43<br>spe<br>or<br>0.9 x<br>0.9 x0<br>0.9 x0<br>0.0 x0<br>0.9 x0 x00000000000000000000000000  | <ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>g<br/>cific data<br/>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>3</li> <li>0.63</li> <li>530.59</li> <li>907.66</li> </ul>  | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> <li>780.80</li> </ul>              | 3.00         -108.81         116.48         430.21         data         6c         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         =         235.21         665.42   | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>451.74 (<br>67.01 (<br>14.97 (<br>16.03 (<br>166.65 (<br>618.39 (  | <ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>73)</li> <li>75)</li> <li>81)</li> <li>83)</li> <li>84)</li> </ul>              |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int                                     | (-108.81)<br>gains (Table<br>(122.13)<br>ains (66)m<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(464.55)<br>(466.05)<br>(466.05)<br>(466.05)   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37<br>462.37<br>  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)m</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>480.70</li> <li>+ (83)m</li> <li>927.97</li> <li>ing season</li> </ul>  | 3.00<br>-108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x  | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65<br>730.96<br>1128.66  | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>2 X 3<br>X 3<br>X 4<br>X 1<br>X 1<br>739.07<br>1112.73  | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>706.93<br>1065.05          | -108.81          -108.81         100.00         364.43         spe         0.9 x         0.9 x         0.9 x         0.9 x         0.9 x         0.9 x         990.92  | <ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>377.07</li> <li>g<br/>cific data<br/>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>3</li> <li>0.63</li> <li>530.59</li> <li>907.66</li> </ul>  | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> <li>780.80</li> </ul>              | 3.00<br>-108.81<br>116.48<br>430.21<br>data<br>6c<br>= [<br>= [<br>= [<br>] = [<br>235.21<br>665.42  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (<br>14.97 (<br>16.03 (<br>166.65 (<br>618.39 (   | <ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>73)</li> <li>75)</li> <li>81)</li> <li>83)</li> <li>84)</li> </ul>              |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int<br>7. Mean intern                  | atts $\Sigma(74)$ m<br>195.50<br>ernal and sc<br>660.05<br>al tempera   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (f<br>462.37<br>462.37<br>(82)m<br>338.91<br>blar (73)m +<br>801.28<br>.ture (heating a particular in the second | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)n</li> <li>447.27</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>10.7</li>     &lt;</ul>  | 3.00<br>-108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x  | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65<br>730.96<br>1128.66  | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>V<br>373.66<br>X<br>1<br>X<br>1<br>X<br>1<br>X<br>1<br>X<br>1<br>739.07<br>1112.73   | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>1.28 x<br>1.28 x<br>1.28 x | -108.81          -108.81         100.00         364.43         spe         or         0.9 x         0.9 x         0.9 x         0.9 x         0.9 x         0.9 x         990.92   | <ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>g<br/>cific data<br/>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>3</li> <li>0.63</li> <li>530.59</li> <li>907.66</li> </ul>  | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> <li>780.80</li> </ul>              | 3.00<br>-108.81<br>116.48<br>430.21<br>data<br>6c<br>= [<br>= [<br>= [<br>] = [<br>235.21<br>665.42  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (<br>14.97 (<br>16.03 (<br>166.65 (<br>618.39 (<br>21.00 (  | 70)<br>71)<br>72)<br>73)<br>73)<br>77)<br>78)<br>75)<br>81)<br>83)<br>83)<br>84)   |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int<br>7. Mean intern<br>Temperature du | atts $\Sigma(74)$ m<br>195.50<br>660.05<br>195.50<br>660.05<br>195.50<br>660.05<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50<br>195.50   | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (r<br>462.37<br>462.37<br>(82)m<br>338.91<br>blar (73)m +<br>801.28<br><br>801.28<br>   | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)n</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>10.7</li> <li< td=""><td>-108.81<br/>108.67<br/>m + (70)m<br/>422.78<br/>Factor<br/>6d<br/>7 x [<br/>7 x</td><td><ul> <li>3.00</li> <li>-108.81</li> <li>104.49</li> <li>+ (71)m + (7)</li> <li>397.70</li> <li>Area m<sup>2</sup></li> <li>8.67</li> <li>4.69</li> <li>4.34</li> <li>4.65</li> <li>730.96</li> <li>1128.66</li> <li>Table 9, Th1</li> </ul></td><td>3.00<br/>-108.81<br/>98.59<br/>72)m<br/>373.66<br/>Sola<br/>W<br/>373.66<br/>X<br/>373.66<br/>X<br/>1<br/>X<br/>1<br/>X<br/>1<br/>739.07<br/>1112.73<br/>(°C)</td><td>3.00<br/>-108.81<br/>93.59<br/>358.12<br/>ar flux<br/>//m<sup>2</sup><br/>6.79 x<br/>6.75 x<br/>1.28 x<br/>1.28 x<br/>706.93<br/>1065.05</td><td>-108.81<br/>100.00<br/>364.43<br/>spe<br/>or<br/>0.9 x<br/>0.9 x</td><td><ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>8</li> <li>cific data</li> <li>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>2</li> <li>30.63</li> <li>2</li> <li>30.59</li> <li>907.66</li> </ul></td><td><ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> <li>780.80</li> </ul></td><td>3.00<br/>-108.81<br/>116.48<br/>430.21<br/>430.21<br/>56c<br/>= [<br/>= [<br/>= [<br/>] = [<br/>] = [<br/>235.21<br/>665.42</td><td>3.00 (<br/>-108.81 (<br/>119.86 (<br/>451.74 (<br/>Gains<br/>W<br/>97.49 (<br/>67.01 (<br/>14.97 (<br/>16.03 (<br/>166.65 (<br/>618.39 (<br/>21.00 (</td><td><ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>73)</li> <li>75)</li> <li>81)</li> <li>83)</li> <li>84)</li> <li>85)</li> </ul></td></li<></ul>  | -108.81<br>108.67<br>m + (70)m<br>422.78<br>Factor<br>6d<br>7 x [<br>7 x | <ul> <li>3.00</li> <li>-108.81</li> <li>104.49</li> <li>+ (71)m + (7)</li> <li>397.70</li> <li>Area m<sup>2</sup></li> <li>8.67</li> <li>4.69</li> <li>4.34</li> <li>4.65</li> <li>730.96</li> <li>1128.66</li> <li>Table 9, Th1</li> </ul> | 3.00<br>-108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66<br>X<br>373.66<br>X<br>1<br>X<br>1<br>X<br>1<br>739.07<br>1112.73<br>(°C)  | 3.00<br>-108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>706.93<br>1065.05          | -108.81<br>100.00<br>364.43<br>spe<br>or<br>0.9 x<br>0.9 x  | <ul> <li>3.00</li> <li>-108.81</li> <li>102.28</li> <li>377.07</li> <li>8</li> <li>cific data</li> <li>Table 6b</li> <li>0.63</li> <li>2</li> <li>0.63</li> <li>2</li> <li>30.63</li> <li>2</li> <li>30.59</li> <li>907.66</li> </ul>   | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> <li>780.80</li> </ul>              | 3.00<br>-108.81<br>116.48<br>430.21<br>430.21<br>56c<br>= [<br>= [<br>= [<br>] = [<br>] = [<br>235.21<br>665.42  | 3.00 (<br>-108.81 (<br>119.86 (<br>451.74 (<br>Gains<br>W<br>97.49 (<br>67.01 (<br>14.97 (<br>16.03 (<br>166.65 (<br>618.39 (<br>21.00 (  | <ul> <li>70)</li> <li>71)</li> <li>72)</li> <li>73)</li> <li>73)</li> <li>75)</li> <li>81)</li> <li>83)</li> <li>84)</li> <li>85)</li> </ul> |
| Losses e.g. evap<br>Water heating g<br>Total internal g<br>6. Solar gains<br>SouthEast<br>South<br>NorthEast<br>NorthWest<br>Solar gains in w<br>Total gains - int<br>7. Mean intern<br>Temperature du | atts $\Sigma(74)$ m<br>and temperature<br>and temperature  | 3.00<br>ble 5)<br>-108.81<br>5)<br>119.85<br>+ (67)m + (0<br>462.37<br>462.37<br>  | <ul> <li>3.00</li> <li>-108.81</li> <li>115.11</li> <li>68)m + (69)m</li> <li>447.27</li> <li>Access f<br/>Table</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>0.7</li> <li>10.7</li> <li< td=""><td>-108.81<br/>108.67<br/>m + (70)m<br/>422.78<br/>factor<br/>6d<br/>7 x [<br/>7 x</td><td>3.00<br/>-108.81<br/>104.49<br/>+ (71)m + (7<br/>397.70<br/>Area<br/>m<sup>2</sup><br/>8.67<br/>4.69<br/>4.34<br/>4.65<br/>730.96<br/>1128.66<br/>Table 9, Th1<br/>May</td><td>-108.81<br/>98.59<br/>72)m<br/>373.66<br/>Sola<br/>W<br/>373.66<br/>X<br/>373.67<br/>X<br/>1112.73<br/>(°C)<br/>Jun</td><td>-108.81<br/>93.59<br/>358.12<br/>ar flux<br/>//m<sup>2</sup><br/>6.79 x<br/>6.75 x<br/>1.28 x<br/>1.28 x<br/>1.28 x<br/>1.28 x<br/>1.065.05</td><td>-108.81<br/>100.00<br/>364.43<br/>spe<br/>or<br/>0.9 x<br/>0.9 x<br/>0.0 x<br/>0 x<br/>0 x<br/>0 x<br/>0 x<br/>0 x<br/>0 x<br/>0 x<br/>0</td><td>  -108.81<br/>  102.28<br/>  377.07<br/>  377.07<br/> </td><td><ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> <li>780.80</li> <li>Oct</li> </ul></td><td>3.00<br/>-108.81<br/>116.48<br/>430.21<br/>data<br/>6c<br/>= [<br/>= [<br/>= [<br/>235.21<br/>665.42<br/>Nov</td><td><ul> <li>3.00 (</li> <li>-108.81 (</li> <li>119.86 (</li> <li>451.74 (</li> <li>451.74 (</li> <li>97.49 (</li> <li>67.01 (</li> <li>14.97 (</li> <li>16.03 (</li> <li>166.65 (</li> <li>618.39 (</li> <li>21.00 (</li> <li>Dec (</li> </ul></td><td>70)<br/>71)<br/>72)<br/>73)<br/>73)<br/>75)<br/>81)<br/>83)<br/>83)<br/>84)<br/>85)</td></li<></ul> | -108.81<br>108.67<br>m + (70)m<br>422.78<br>factor<br>6d<br>7 x [<br>7 x | 3.00<br>-108.81<br>104.49<br>+ (71)m + (7<br>397.70<br>Area<br>m <sup>2</sup><br>8.67<br>4.69<br>4.34<br>4.65<br>730.96<br>1128.66<br>Table 9, Th1<br>May   | -108.81<br>98.59<br>72)m<br>373.66<br>Sola<br>W<br>373.66<br>X<br>373.67<br>X<br>1112.73<br>(°C)<br>Jun  | -108.81<br>93.59<br>358.12<br>ar flux<br>//m <sup>2</sup><br>6.79 x<br>6.75 x<br>1.28 x<br>1.28 x<br>1.28 x<br>1.28 x<br>1.065.05       | -108.81<br>100.00<br>364.43<br>spe<br>or<br>0.9 x<br>0.9 x<br>0.0 x<br>0 x<br>0 x<br>0 x<br>0 x<br>0 x<br>0 x<br>0 x<br>0 | -108.81<br>  102.28<br>  377.07<br>  377.07<br> | <ul> <li>3.00</li> <li>-108.81</li> <li>108.95</li> <li>401.78</li> <li>FF specific c or Table</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>0.70</li> <li>379.02</li> <li>780.80</li> <li>Oct</li> </ul> | 3.00<br>-108.81<br>116.48<br>430.21<br>data<br>6c<br>= [<br>= [<br>= [<br>235.21<br>665.42<br>Nov  | <ul> <li>3.00 (</li> <li>-108.81 (</li> <li>119.86 (</li> <li>451.74 (</li> <li>451.74 (</li> <li>97.49 (</li> <li>67.01 (</li> <li>14.97 (</li> <li>16.03 (</li> <li>166.65 (</li> <li>618.39 (</li> <li>21.00 (</li> <li>Dec (</li> </ul> | 70)<br>71)<br>72)<br>73)<br>73)<br>75)<br>81)<br>83)<br>83)<br>84)<br>85)  |

|                       | 1.00        | 0.99         | 0.98        | 0.93          | 0.81            | 0.63         | 0.47     | 0.53   | 0.78   | 0.96                  | 0.99           | 1.00    | (86)               |
|-----------------------|-------------|--------------|-------------|---------------|-----------------|--------------|----------|--------|--------|-----------------------|----------------|---------|--------------------|
| Mean internal temp    | o of living | g area T1 (s | teps 3 to 7 | in Table 9c   | :)              |              |          |        |        |                       |                |         |                    |
|                       | 19.74       | 19.94        | 20.23       | 20.58         | 20.84           | 20.96        | 20.99    | 20.99  | 20.91  | 20.55                 | 20.08          | 19.71   | (87)               |
| Temperature during    | g heating   | periods in   | the rest of | f dwelling fi | rom Table 9     | 9, Th2(°C)   |          |        |        |                       |                |         |                    |
|                       | 19.91       | 19.91        | 19.91       | 19.92         | 19.93           | 19.93        | 19.93    | 19.94  | 19.93  | 19.93                 | 19.92          | 19.92   | (88)               |
| Utilisation factor fo | r gains fo  | or rest of d | welling n2, | m             |                 | •            | •        |        | •      |                       | •              |         | _                  |
|                       | 1.00        | 0.99         | 0.97        | 0.90          | 0.76            | 0.54         | 0.36     | 0.41   | 0.69   | 0.94                  | 0.99           | 1.00    | (89)               |
| Mean internal tem     | perature    | in the rest  | of dwelling | g T2 (follow  | steps 3 to      | 7 in Table 9 | )<br>Jc) |        |        | 1                     | 1              | 1       |                    |
|                       | 18 25       | 18 54        | 18 96       | 19 44         | 19 78           | 19 91        | , 19.93  | 19.93  | 19.86  | 19.42                 | 18 74          | 18 20   | (90)               |
| Living area fraction  | 10.25       | 10.01        | 10.50       | 10.11         | 15.70           | 10.01        | 19.99    | 10.00  | 15.00  | ving area ÷           | (4) =          | 0.37    | ) (91)             |
| Mean internal tem     | nerature    | for the wh   | ole dwellin | σ fl Δ v T1 + | -(1 - fl A) v T | г?           |          |        |        | ving area .           | (+) -          | 0.57    | ] (31)             |
|                       | 19 70       | 10.05        | 10.42       | 10.96         | 20.17           | 20.20        | 20.22    | 20.22  | 20.24  | 10.94                 | 10.22          | 19.75   | (02)               |
|                       | 10.79       | 19.05        | 19.42       | 19.00         | 20.17           | 20.50        | 20.52    | 20.52  | 20.24  | 19.64                 | 19.25          | 10.75   | ] (92)             |
|                       |             |              |             |               |                 |              |          | 20.22  | 20.24  | 10.04                 | 40.00          | 40.75   |                    |
|                       | 18.79       | 19.05        | 19.42       | 19.86         | 20.17           | 20.30        | 20.32    | 20.32  | 20.24  | 19.84                 | 19.23          | 18.75   | ] (93)             |
| 8. Space heating r    | equirem     | ent          |             |               |                 |              |          |        |        |                       |                |         |                    |
|                       | Jan         | Feb          | Mar         | Apr           | Mav             | Jun          | Jul      | Aug    | Sep    | Oct                   | Nov            | Dec     |                    |
| Utilisation factor fo | r gains, n  | im           |             | ľ             |                 |              |          | . 6    |        |                       |                |         |                    |
|                       |             | 0 99         | 0.96        | 0.90          | 0.77            | 0.57         | 0.40     | 0.45   | 0.72   | 0.93                  | 0.99           | 1.00    | (94)               |
| Liseful gains nmGm    | n W (94)    | )m x (84)m   | 0.50        | 0.50          | 0.77            | 0.57         | 0.40     | 0.45   | 0.72   | 0.55                  | 0.55           | 1.00    | ] (34)             |
|                       |             | 700.21       | 902 E0      | 045.96        | 970 64          | 620 72       | 129 10   | 149.12 | 652.22 | 770 60                | 656 57         | 615 57  |                    |
| Monthly average of    | vtorpal to  | 765.51       | from Tabl   | 0.111         | 870.04          | 038.75       | 420.19   | 440.13 | 032.32 | 728.08                | 030.37         | 015.57  | ] (55)             |
|                       |             |              |             |               | 11.70           | 14.60        | 16.60    | 16.40  | 1110   | 10.00                 | 7.10           | 1.20    |                    |
|                       | 4.30        | 4.90         | 6.50        | 8.90          | 11.70           | 14.60        | 16.60    | 16.40  | 14.10  | 10.60                 | 7.10           | 4.20    | ] (96)             |
| Heat loss rate for in |             | rnal tempe   | rature, Lm  | , w [(39)m    | x [(93)m -      | (96)mj       |          |        |        | 1                     | 1              | 1       | 7 (n=)             |
| 1                     | ./23.09     | 16/8.84      | 1529.63     | 1284.16       | 990.08          | 660.39       | 431.23   | 453.44 | /14.58 | 1080.29               | 1424.28        | 1/15.1/ | ] (97)             |
| Space heating requ    | irement,    | kWh/mon      | th 0.024 x  | [(97)m - (9   | 5)m] x (41)i    | m            |          |        |        |                       |                |         | г                  |
|                       | 793.89      | 597.76       | 473.28      | 243.58        | 88.86           | 0.00         | 0.00     | 0.00   | 0.00   | 261.60                | 552.76         | 818.10  | ]                  |
|                       |             |              |             |               |                 |              |          |        | ∑(9)   | 8)15, 10              | .12 = 3        | 3829.82 | <b>] (98)</b><br>ר |
| Space heating requ    | irement l   | kWh/m²/ye    | ear         |               |                 |              |          |        |        | (98)                  | ÷ (4)          | 39.08   | (99)               |
| 9a. Energy require    | ements -    | individual   | heating sv  | stems inclu   | ding micro      | -CHP         |          |        |        |                       |                |         |                    |
| Space beating         |             |              |             |               |                 |              |          |        |        |                       |                |         |                    |
| Eraction of space by  | eat from    | secondary    | sunnleme    | ntary system  | m (table 11     | 1            |          |        |        |                       |                | 0.00    | 7 (201)            |
| Fraction of space he  | oat from    | main syste   | m(c)        | intary system |                 | 1            |          |        |        | 1 (2)                 | 01) -          | 1.00    | ] (201)<br>] (202) |
| Fraction of space he  | eat from    | main syste   | m 2         |               |                 |              |          |        |        | 1 - (2)               | 01) - <u> </u> | 0.00    | ] (202)<br>] (202) |
| Fraction of total co  |             | from main    | custom 1    |               |                 |              |          |        | (20    | $(2) \times [1] / 20$ | - 1/2          | 1.00    | ] (202)<br>] (204) |
| Fraction of total spa |             | fuene neein  | system 1    |               |                 |              |          |        | (20    | )2) X [1- (20         | 02) [[(C       | 1.00    | ] (204)<br>] (205) |
| Fraction of total spa | ace neat    | from main    | system 2    |               |                 |              |          |        |        | (202) X (2            | 03) = [        | 0.00    | ] (205)<br>] (205) |
| Efficiency of main s  | ystem 1 (   | (%)          |             |               |                 |              |          | _      | -      | •                     |                | 93.50   | ] (206)            |
|                       | Jan         | Feb          | Mar         | Apr           | Мау             | Jun          | Jul      | Aug    | Sep    | Oct                   | Nov            | Dec     |                    |
| Space heating fuel (  | (main sys   | tem 1), kW   | /h/month    |               |                 | 1            |          | 1      | 1      |                       | 1              | 1       | 7                  |
| 8                     | 849.08      | 639.32       | 506.18      | 260.51        | 95.04           | 0.00         | 0.00     | 0.00   | 0.00   | 279.79                | 591.18         | 874.97  |                    |
|                       |             |              |             |               |                 |              |          |        | ∑(21)  | 1)15, 10              | .12 =          | 1096.07 | (211)              |
| Water heating         |             |              |             |               |                 |              |          |        |        |                       |                |         |                    |
| Efficiency of water   | heater      |              |             |               |                 |              |          |        |        |                       |                |         |                    |
|                       | 88.05       | 87.74        | 87.13       | 85.74         | 83.20           | 79.80        | 79.80    | 79.80  | 79.80  | 85.84                 | 87.51          | 88.15   | (217)              |
| Water heating fuel,   | kWh/mc      | onth         |             |               |                 |              |          |        |        |                       |                |         |                    |
|                       | 235.97      | 208.63       | 220.44      | 200.50        | 202.26          | 188.09       | 180.32   | 198.31 | 198.10 | 207.69                | 215.78         | 229.93  | ]                  |
|                       |             |              |             |               |                 |              |          |        |        | ∑(219a)1              | .12 = 2        | 2486.02 | (219)              |
|                       |             |              |             |               |                 |              |          |        |        |                       |                |         |                    |

#### Annual totals Space heating fuel - main system 1 4096.07 Water heating fuel 2486.02 Electricity for pumps, fans and electric keep-hot (Table 4f) central heating pump or water pump within warm air heating unit 30.00 (230c) boiler flue fan 45.00 (230e) (231) Total electricity for the above, kWh/year 75.00 Electricity for lighting (Appendix L) 398.41 (232) Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) = 7055.51 (238)

#### 10a. Fuel costs - individual heating systems including micro-CHP

|   | Fuel<br>kWh/year |     | Fuel price   |              | Fuel<br>cost £/year |       |
|---|------------------|-----|--------------|--------------|---------------------|-------|
| Space heating - main system 1                                   | 4096.07          | ] x | 3.48         | x 0.01 =     | 142.54              | (240) |
| Water heating   | 2486.02          | ] x | 3.48         | x 0.01 =     | 86.51               | (247) |
| Pumps and fans  | 75.00            | ] x | 13.19        | x 0.01 =     | 9.89                | (249) |
| Electricity for lighting  | 398.41           | ] x | 13.19        | x 0.01 =     | 52.55               | (250) |
| Additional standing charges                                     |                  |     |              |              | 120.00              | (251) |
| Total energy cost   |                  |     | (240)(242) + | (245)(254) = | 411.50              | (255) |
| 11a. SAP rating - individual heating systems including micro-CH | Р                |     |              |              |                     |       |
| Energy cost deflator (Table 12)                                 |                  |     |              |              | 0.42                | (256) |
| Energy cost factor (ECF)  |                  |     |              |              | 1.21                | (257) |
| SAP value   |                  |     |              |              | 83.14               | ]     |
| SAP rating (section 13)   |                  |     |              |              | 83                  | (258) |
| SAP band  |                  |     |              |              | В                   | ]     |

12a. CO<sub>2</sub> emissions - individual heating systems including micro-CHP

|  | Energy<br>kWh/year |   | Emission factor<br>kg CO₂/kWh |                   | Emissions<br>kg CO <sub>2</sub> /year |       |
|--|--------------------|---|-------------------------------|-------------------|---------------------------------------|-------|
| Space heating - main system 1          | 4096.07            | x | 0.22                          | = [               | 884.75                                | (261) |
| Water heating                          | 2486.02            | x | 0.22                          | = [               | 536.98                                | (264) |
| Space and water heating                |                    |   | (261) + (262) +               | (263) + (264) = [ | 1421.73                               | (265) |
| Pumps and fans                         | 75.00              | x | 0.52                          | = [               | 38.93                                 | (267) |
| Electricity for lighting               | 398.41             | x | 0.52                          | = [               | 206.78                                | (268) |
| Total CO <sub>2</sub> , kg/year        |                    |   |                               | (265)(271) = [    | 1667.43                               | (272) |
| Dwelling CO <sub>2</sub> emission rate |                    |   |                               | (272) ÷ (4) = [   | 17.01                                 | (273) |
| El value                               |                    |   |                               | [                 | 84.38                                 | ]     |
| El rating (section 14)                 |                    |   |                               | [                 | 84                                    | (274) |
| El band                                |                    |   |                               | [                 | В                                     | ]     |
|  |                    |   |                               |                   |                                       |       |

| 13a. Primary energy - individual heating systems including m | icro-CHP           |   |                 |                 |                            |       |
|--|--------------------|---|-----------------|-----------------|----------------------------|-------|
|  | Energy<br>kWh/year |   | Primary factor  |                 | Primary Energy<br>kWh/year |       |
| Space heating - main system 1                                | 4096.07            | x | 1.22            | =               | 4997.20                    | (261) |
| Water heating  | 2486.02            | х | 1.22            | =               | 3032.95                    | (264) |
| Space and water heating                                      |                    |   | (261) + (262) + | (263) + (264) = | 8030.15                    | (265) |
| Pumps and fans   | 75.00              | х | 3.07            | =               | 230.25                     | (267) |
| Electricity for lighting                                     | 398.41             | х | 3.07            | =               | 1223.13                    | (268) |
| Primary energy kWh/year                                      |                    |   |                 |                 | 9483.53                    | (272) |



| Assessor name                | Mr John         | Simpson       |               |               |               |               |          | Assessor nun                | nber           | 3722     |                    |         |
|------------------------------|-----------------|---------------|---------------|---------------|---------------|---------------|----------|-----------------------------|----------------|----------|--------------------|---------|
| Client                       |                 |               |               |               |               |               |          | Last modified               | Ł              | 19/11,   | /2014              |         |
| Address                      | Unit 4.02       | Marine Ice    | es Haversto   | ck Hill, Lor  | ndon, NW3     | 2BL           |          |                             |                |          |                    |         |
|                              |                 |               |               |               |               |               |          |                             |                |          |                    |         |
| 1. Overall dwelling dime     | nsions          |               |               |               |               |               |          |                             |                |          |                    |         |
|                              |                 |               |               | Д             | vrea (m²)     |               | А        | verage storey<br>height (m) | ,              | Vo       | lume (m³)          |         |
| Lowest occupied              |                 |               |               |               | 100.90        | (1a) x        | Ē        | 2.60                        | ] (2a) =       |          | 262.34             | (3a)    |
| Total floor area             | (1a)            | + (1b) + (1   | c) + (1d)(    | 1n) =         | 100.90        | (4)           |          |                             |                |          |                    |         |
| Dwelling volume              |                 |               |               |               |               |               | (        | 3a) + (3b) + (3             | sc) + (3d)(3   | n) =     | 262.34             | (5)     |
| 2. Ventilation rate          |                 |               |               |               |               |               |          |                             |                |          |                    |         |
|                              |                 |               |               |               |               |               |          |                             |                | m³       | ' per hour         |         |
| Number of chimneys           |                 |               |               |               |               |               |          | 0                           | x 40 =         |          | 0                  | (6a)    |
| Number of open flues         |                 |               |               |               |               |               |          | 0                           | x 20 =         |          | 0                  | (6b)    |
| Number of intermittent fa    | ns              |               |               |               |               |               |          | 4                           | x 10 =         |          | 40                 | (7a)    |
| Number of passive vents      |                 |               |               |               |               |               |          | 0                           | x 10 =         |          | 0                  | (7b)    |
| Number of flueless gas fire  | es              |               |               |               |               |               |          | 0                           | x 40 =         |          | 0                  | (7c)    |
|                              |                 |               |               |               |               |               |          |                             |                | Air c    | hanges pe:<br>hour | r       |
| Infiltration due to chimney  | /s, flues, fans | s, PSVs       |               | (6a)          | ) + (6b) + (7 | a) + (7b) + ( | 7c) =    | 40                          | ÷ (5) =        |          | 0.15               | (8)     |
| If a pressurisation test has | been carried    | d out or is i | ntended, pi   | roceed to (   | (17), otherv  | vise continu  | e from ( | 9) to (16)                  |                |          |                    |         |
| Air permeability value, q50  | D, expressed    | in cubic m    | etres per h   | our per squ   | uare metre    | of envelope   | e area   |                             |                |          | 5.00               | (17)    |
| If based on air permeabilit  | y value, ther   | n (18) = [(17 | 7) ÷ 20] + (8 | 8), otherwi   | se (18) = (1  | 6)            |          |                             |                |          | 0.40               | (18)    |
| Number of sides on which     | the dwelling    | g is sheltere | ed            |               |               |               |          |                             |                |          | 2                  | (19)    |
| Shelter factor               |                 |               |               |               |               |               |          | 1                           | - [0.075 x (19 | )] =     | 0.85               | (20)    |
| Infiltration rate incorporat | ing shelter f   | actor         |               |               |               |               |          |                             | (18) x (2      | 0) =     | 0.34               | (21)    |
| Infiltration rate modified f | or monthly v    | wind speed    | :             |               |               |               |          |                             |                |          |                    |         |
| Jan                          | Feb             | Mar           | Apr           | Мау           | Jun           | Jul           | Aug      | Sep                         | Oct            | Nov      | Dec                |         |
| Monthly average wind spe     | ed from Tab     | le U2         |               |               |               | -             |          |                             |                |          |                    | _       |
| 5.10                         | 5.00            | 4.90          | 4.40          | 4.30          | 3.80          | 3.80          | 3.70     | 4.00                        | 4.30           | 4.50     | 4.70               | (22)    |
| Wind factor (22)m ÷ 4        | _               |               |               |               | -1            |               | 1        |                             |                |          |                    | -       |
| 1.28                         | 1.25            | 1.23          | 1.10          | 1.08          | 0.95          | 0.95          | 0.93     | 1.00                        | 1.08           | 1.13     | 1.18               | (22a)   |
| Adjusted infiltration rate ( | allowing for    | shelter and   | I wind facto  | or) (21) x (2 | 22a)m         | 1             |          |                             |                |          | 1                  | ۲       |
| 0.44                         | 0.43            | 0.42          | 0.38          | 0.37          | 0.32          | 0.32          | 0.32     | 0.34                        | 0.37           | 0.38     | 0.40               | (22b)   |
| Calculate effective air chai | nge rate for i  | the applica   | ble case:     |               |               |               |          |                             |                | <b>—</b> |                    | (22-)   |
| If helenced with heat r      | on: air chang   | e rate throu  | allowing fo   | r in uso fa   | ctor from T   | Tabla 1b      |          |                             |                |          | N/A                | (23a)   |
| d) natural ventilation o     | r whole hou     | se positive   | input venti   | lation from   | n loft        | avie 411      |          |                             |                |          | N/A                | _ (230) |
|                              | 0.59            | 0.59          | 0.57          | 0.57          | 0.55          | 0.55          | 0 55     | 0.56                        | 0.57           | 0.57     | 0.58               | (24d)   |
| Effective air change rate -  | enter (24a) o   | or (24b) or   | (24c) or (24  | d) in (25)    | 0.00          |               | 1 0.00   |                             |                | 2.07     |                    | (= ,∞)  |
| 0.60                         | 0.59            | 0.59          | 0.57          | 0.57          | 0.55          | 0.55          | 0.55     | 0.56                        | 0.57           | 0.57     | 0.58               | (25)    |
|                              |                 |               |               |               |               |               |          |                             |                |          |                    | · · · / |



|  | and near ios   | s paramet  |   |  |  |  |  |  |   |   |  |   |  |
|--|--|--|---|--|--|--|--|--|---|---|--|---|--|
| Element  |  |  | а   | Gross<br>rea, m²   | Openings<br>m <sup>2</sup>   | Net<br>A,  | area<br>m²   | U-value<br>W/m²K   | A x U W   | //К к-\<br>kJ   | /alue,<br>/m².K  | Ахк,<br>kJ/K  |  |
| Window   |  |  |   |  |  | 23   | .08 x  | 1.33   | = 30.60   | )   |  |   | (27)   |
| Door   |  |  |   |  |  | 2.   | 14 x   | 1.00   | = 2.14  |   |  |   | (26)   |
| External wall  |  |  |   |  |  | 90   | .29 x  | 0.18   | = 16.25   | 5   |  |   | (29a   |
| Roof   |  |  |   |  |  | 100  | 0.90 x   | 0.13   | = 13.12   | 2   |  |   | (30)   |
| Total area of ext  | ternal eleme   | ents ∑A, m <sup>2</sup>  | 2   |  |  | 216  | 5.41   |  |   |   |  |   | (31)   |
| Fabric heat loss,  | W/K = Σ(A  | × U)   |   |  |  |  |  |  | (2  | 6)(30) + (  | 32) =  | 62.11   | (33)   |
| Heat capacity Cr   | m = ∑(А x к)   |  |   |  |  |  |  | (28)   | .(30) + (32)                                      | + (32a)(3   | 2e) =  | N/A   | (34)   |
| Thermal mass pa  | arameter (T  | MP) in kJ/r  | m²K   |  |  |  |  |  |   |   |  | 250.00  | (35)   |
| Thermal bridges  | s: Σ(L x Ψ) ca   | lculated u   | sing Appen  | dix K  |  |  |  |  |   |   |  | 10.62   | (36)   |
| Total fabric heat  | t loss   |  |   |  |  |  |  |  |   | (33) + (  | 36) =  | 72.73   | (37)   |
|  | Jan  | Feb  | Mar   | Apr  | May  | Jun  | Jul  | Aug  | Sep   | Oct   | Nov  | Dec   | · ·  |
| Ventilation heat   | : loss calcula   | ted month  | nly 0.33 x (2   | 25)m x (5)   | -  |  |  |  |   |   |  |   |  |
|  | 51.52  | 51.20  | 50.89   | 49.42  | 49.14  | 47.86  | 47.86  | 47.62  | 48.35   | 49.14   | 49.70  | 50.28   | (38)   |
| Heat transfer co   | efficient, W   | /K (37)m -   | + (38)m   |  | 1  |  |  | 1  |   |   |  | 1   | ``   |
|  | 124.25   | 123.93   | 123.61  | 122.14   | 121.87   | 120.58   | 120.58   | 120.35   | 121.08  | 121.87  | 122.42   | 123.01  |  |
|  |  |  | 1   |  | II   |  |  |  | Average =   | Σ(39)112  | /12 =  | 122.14  | <br>(39)   |
| Heat loss param  | eter (HLP), '  | W/m²K (39  | 9)m ÷ (4)   |  |  |  |  |  | 0   | ,   |  |   |  |
|  | 1.23   | 1.23   | 1.23  | 1.21   | 1.21   | 1.20   | 1.20   | 1.19   | 1.20  | 1.21  | 1.21   | 1.22  |  |
|  |  |  |   |  |  |  |  |  | Average =   | $\Sigma(40)112$   | /12 =  | 1.21  | (40)   |
| Number of davs   | in month (1  | able 1a)   |   |  |  |  |  |  | , nonago ,  | 2( ,  |  |   | _ ()   |
|  | 21.00  | ,  | 1   | -  |  |  |  |  |   |   |  |   | _  |
|  | 3100   | 28.00  | 31.00   | 30.00  | 31.00  | 30.00  | 31.00  | 31.00  | 30.00   | 31.00   | 30.00  | 31.00   | (40)   |
|  | 31.00  | 28.00  | 31.00   | 30.00  | 31.00  | 30.00  | 31.00  | 31.00  | 30.00   | 31.00   | 30.00  | 31.00   | (40)   |
| 4. Water heati   | ng energy re   | 28.00<br>equiremen   | 31.00   | 30.00  | 31.00  | 30.00  | 31.00  | 31.00  | 30.00   | 31.00   | 30.00  | 31.00   | _ (40)   |
| 4. Water heatin  | ng energy reancy, N  | 28.00<br>equiremen   | 31.00   | 30.00  | 31.00  | 30.00  | 31.00  | 31.00  | 30.00   | 31.00   | 30.00  | 2.75  | (40)<br>(42)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average  | ng energy re<br>ancy, N<br>hot water u   | 28.00<br>equiremen<br>sage in litr   | at 31.00  | 30.00<br>Vd,average  | 31.00 = (25 x N) +   | 30.00<br>36  | 31.00  | 31.00  | 30.00   | 31.00   | 30.00  | 31.00<br>2.75<br>99.46  | (40)<br>(42)<br>(43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average  | ng energy ro<br>ancy, N<br>hot water u<br>Jan  | 28.00<br>equiremen<br>sage in litr<br>Feb  | at<br>es per day<br>Mar   | 30.00<br>Vd,average<br><b>Apr</b>  | 31.00<br>= (25 x N) +<br>May   | 30.00<br>36<br>Jun   | 31.00<br>Jul   | 31.00  | 30.00   | 31.00   | 30.00  | 31.00<br>2.75<br>99.46<br><b>Dec</b>  | (40)<br>(42)<br>(43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe  | 28.00<br>equiremen<br>sage in litr<br><b>Feb</b><br>r day for ea   | at 31.00<br>at<br>mes per day<br>Mar<br>ach month   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact   | 31.00<br>= (25 x N) +<br>May<br>for from Table   | 30.00<br>36<br>Jun<br>le 1c x (43  | 31.00<br>Jul   | 31.00  | 30.00   | 31.00   | 30.00  | 2.75<br>99.46<br><b>Dec</b>   | (40)<br>(42)<br>(43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40  | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43  | ach month   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47  | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51   | 31.00<br>Jul<br>)<br>89.51   | 31.00<br>Aug<br>93.49  | 30.00<br>Sep<br>97.47                             | 31.00<br>Oct<br>101.45  | 30.00  | 31.00<br>2.75<br>99.46<br><b>Dec</b><br>109.40  | _ (40)<br>_ (42)<br>_ (43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage   | ng energy re<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40  | 28.00<br>equirement<br>sage in litr<br>Feb<br>r day for ea<br>105.43   | 31.00<br>at<br>mes per day<br>Mar<br>ach month<br>101.45  | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47  | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51   | 31.00<br>Jul<br>)<br>89.51   | 31.00<br>Aug<br>93.49  | 30.00<br>Sep<br>97.47                             | 31.00<br>Οct<br>101.45<br>Σ(44)1  | 30.00  | 2.75<br>99.46<br>Dec<br>109.40<br>1193.50   | _ (40)<br>_ (42)<br>_ (43)<br>_ (43)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of  | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40  | 28.00<br>equirements<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.1  | at 31.00<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10  | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47  | 31.00<br>= (25 x N) +<br>May<br>:or from Tabl<br>93.49<br>8600 kWh/m   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51   | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,   | 31.00<br>Aug<br>93.49<br>1c 1d)  | 30.00<br>Sep<br>97.47                             | 31.00<br>Oct<br>101.45<br>Σ(44)1  | 30.00<br>Nov<br>105.43<br>.12 =  | 2.75<br>99.46<br>Dec<br>109.40  | _ (40)<br>_ (42)<br>_ (43)<br>_ (44)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content o   | ng energy reancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24  | 28.00<br>equirement<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.<br>141.90  | 31.00<br>at<br>mes per day<br>Mar<br>ach month<br>101.45<br>18 x Vd,m x<br>146.43   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>: nm x Tm/3<br>127.66   | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>8600 kWh/m<br>122.49   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>onth (see<br>105.70  | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95  | 31.00<br>Aug<br>93.49<br>1c 1d)<br>112.40  | 30.00<br>Sep<br>97.47<br>113.74                   | 31.00<br>Oct<br>101.45<br>Σ(44)1<br>132.55  | 30.00<br>Nov<br>105.43<br>.12 =  | 2.75<br>99.46<br>Dec<br>109.40<br>1193.50   | _ (40)<br>_ (42)<br>_ (43)<br>_ (44)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content o   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24  | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.<br>141.90   | 31.00<br>at<br>Mar<br>ach month<br>101.45<br>18 x Vd,m x<br>146.43  | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>: nm x Tm/3<br>127.66   | 31.00<br>= (25 x N) +<br>May<br>cor from Tabl<br>93.49<br>8600 kWh/m<br>122.49   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>onth (see<br>105.70  | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95  | 31.00<br>Aug<br>93.49<br>1c 1d)<br>112.40  | 30.00<br>Sep<br>97.47<br>113.74                   | 31.00<br>Οct<br>101.45<br>Σ(44)1<br>132.55<br>Σ(45)1  | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =                       | 31.00<br>2.75<br>99.46<br><b>Dec</b><br>109.40<br>1193.50<br>157.12<br>1564.86  | _ (40)<br>_ (42)<br>_ (43)<br>_ (44)<br>_ (44)<br>_ (45)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss   | ng energy reancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>; 0.15 x (45)   | 28.00<br>equirement<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.1<br>141.90   | 31.00<br>at<br>mes per day<br>Mar<br>ach month<br>101.45<br>18 x Vd,m x<br>146.43   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>: nm x Tm/3<br>127.66   | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>3600 kWh/m<br>122.49   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>onth (see<br>105.70  | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95  | Aug<br>93.49<br>1c 1d)<br>112.40   | 30.00<br>Sep<br>97.47<br>113.74                   | 31.00           Oct           101.45           Σ(44)1           132.55           Σ(45)1                                 | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =                       | 2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>1564.86  | _ (40)<br>_ (42)<br>_ (43)<br>_ (44)<br>_ (45)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>s 0.15 x (45)<br>24.34  | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28  | 31.00<br>at<br>mar<br>mar<br>ach month<br>101.45<br>18 x Vd,m x<br>146.43<br>21.96  | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>: nm x Tm/3<br>127.66<br>19.15  | 31.00<br>= (25 x N) +<br>May<br>cor from Tabl<br>93.49<br>8600 kWh/m<br>122.49<br>18.37  | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>000000000000000000000000000000000000                                       | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95  | 31.00<br>Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86   | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | <b>Oct</b><br>101.45<br>Σ(44)1<br>132.55<br>Σ(45)1<br>19.88   | 30.00<br>Nov<br>105.43<br>.12 =<br>.12 =<br>21.70                        | 2.75<br>99.46<br><b>Dec</b><br>109.40<br>1193.50<br>1554.86<br>23.57  | _ (40)<br>] (42)<br>] (43)<br>] (43)<br>] (44)<br>] (45)<br>] (46)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Storage volume   | 31.00         ng energy real         ancy, N         hot water u         Jan         e in litres pe         109.40         of hot water         162.24         5       0.15 x (45)         24.34         (litres) inclu  | 28.00<br>equirement<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.1<br>141.90<br>m<br>21.28<br>uding any s  | 31.00<br>at<br>acs per day<br>Mar<br>ach month<br>101.45<br>18 × Vd,m ×<br>146.43<br>21.96<br>olar or WW  | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>nm x Tm/3<br>127.66<br>19.15<br>/HRS storag   | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>3600 kWh/m<br>122.49<br>18.37<br>te within sam                                   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>0nth (see<br>105.70<br>15.86<br>ne vessel                                  | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69   | Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86  | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00           Oct           101.45           Σ(44)1           132.55           Σ(45)1           19.88                 | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | 2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>1564.86<br>23.57<br>150.00   | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)   |
| <ul> <li>4. Water heatin</li> <li>Assumed occupa</li> <li>Annual average</li> <li>Hot water usage</li> <li>Energy content of</li> <li>Distribution loss</li> <li>Storage volume</li> <li>Water storage lo</li> </ul>   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>c 0.15 x (45)<br>24.34<br>(litres) inclu  | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>uding any s   | 31.00<br>at<br>es per day<br>Mar<br>ach month<br>101.45<br>18 x Vd,m x<br>146.43<br>21.96<br>olar or WW   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>: nm x Tm/3<br>127.66<br>19.15<br>/HRS storag   | 31.00<br>= (25 x N) +<br>May<br>cor from Tabl<br>93.49<br>8600 kWh/m<br>122.49<br>18.37<br>te within sam                                   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>000000000000000000000000000000000000                                       | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69   | Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86  | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00           Oct           101.45           Σ(44)1           132.55           Σ(45)1           19.88                 | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | <ul> <li>31.00</li> <li>2.75</li> <li>99.46</li> <li>Dec</li> <li>109.40</li> <li>1193.50</li> <li>157.12</li> <li>1564.86</li> <li>23.57</li> <li>150.00</li> </ul>                                      | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)   |
| 4. Water heatin<br>Assumed occupa<br>Annual average<br>Hot water usage<br>Energy content of<br>Distribution loss<br>Storage volume<br>Water storage lo<br>a) If manufactur   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>s 0.15 x (45)<br>24.34<br>(litres) inclu<br>oss:<br>rer's declare   | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>uding any s   | 31.00<br>at<br>acs per day<br>Mar<br>ach month<br>101.45<br>18 x Vd,m x<br>146.43<br>21.96<br>olar or WW<br>or is known   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>anm x Tm/3<br>127.66<br>19.15<br>/HRS storag<br>(kWh/day)   | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>3600 kWh/m<br>122.49<br>18.37<br>te within sam                                   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>0nth (see<br>105.70<br>15.86<br>ne vessel                                  | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69   | Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86  | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00         Oct         101.45         Σ(44)1         132.55         Σ(45)1         19.88                             | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | 31.00<br>2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>1564.86<br>23.57<br>150.00<br>1.39  | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)   |
| <ul> <li>4. Water heatin</li> <li>Assumed occupa</li> <li>Annual average</li> <li>Hot water usage</li> <li>Energy content of</li> <li>Distribution loss</li> <li>Storage volume</li> <li>Water storage lo</li> <li>a) If manufactur</li> <li>Temperature</li> </ul>  | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>c 0.15 x (45)<br>24.34<br>(litres) inclu<br>coss:<br>rer's declare<br>e factor from   | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>uding any s<br>d loss facto   | 31.00         at         mar         ach month         101.45         18 x Vd,m x         146.43         21.96         olar or WW         or is known   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>: nm x Tm/3<br>127.66<br>19.15<br>/HRS storag<br>(kWh/day)  | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>8600 kWh/m<br>122.49<br>18.37<br>re within sam                                   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>000000000000000000000000000000000000                                       | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69   | 31.00<br>Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86   | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00           Oct           101.45           Σ(44)1           132.55           Σ(45)1           19.88                 | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | 31.00<br>2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>1564.86<br>23.57<br>150.00<br>1.39<br>0.54  | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(49)                                 |
| <ul> <li>4. Water heatin</li> <li>Assumed occupa</li> <li>Annual average</li> <li>Hot water usage</li> <li>Energy content of</li> <li>Distribution loss</li> <li>Storage volume</li> <li>Water storage log</li> <li>a) If manufactur</li> <li>Temperature</li> <li>Energy lost fr</li> </ul>   | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>s 0.15 x (45)<br>24.34<br>(litres) inclu<br>oss:<br>rer's declare<br>e factor from<br>rom water s   | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>uding any s<br>d loss facto<br>n Table 2b<br>torage (kW   | 31.00         nt         res per day         Mar         ach month         101.45         18 x Vd,m x         146.43         21.96         olar or WW         or is known         vh/day) (48)  | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>anm x Tm/3<br>127.66<br>19.15<br>/HRS storag<br>(kWh/day)<br>3) x (49)  | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>8600 kWh/m<br>122.49<br>18.37<br>re within sam                                   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>0nth (see<br>105.70<br>15.86<br>ne vessel                                  | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69   | Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86  | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00         Oct         101.45         Σ(44)1         132.55         Σ(45)1         19.88                             | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | 31.00<br>2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>1564.86<br>23.57<br>150.00<br>1.39<br>0.54<br>0.75  | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(47)<br>(47)<br>(49)<br>(50)                                 |
| <ul> <li>4. Water heatin</li> <li>Assumed occupa</li> <li>Annual average</li> <li>Hot water usage</li> <li>Energy content of</li> <li>Distribution loss</li> <li>Storage volume</li> <li>Water storage lo</li> <li>a) If manufactur</li> <li>Temperature</li> <li>Energy lost fr</li> <li>Enter (50) or (54)</li> </ul>  | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>conto x (45)<br>24.34<br>(litres) incluoss:<br>rer's declare<br>e factor from<br>rom water s<br>a) in (55)  | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>uding any s<br>d loss facto<br>n Table 2b<br>torage (kW   | 31.00         nt         res per day '         Mar         ach month         101.45         18 x Vd,m x         146.43         21.96         olar or WW         or is known         vh/day) (48   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>anm x Tm/3<br>127.66<br>19.15<br>/HRS storag<br>(kWh/day)<br>8) x (49)  | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>8600 kWh/m<br>122.49<br>18.37<br>te within sam                                   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>000000000000000000000000000000000000                                       | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69   | Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86  | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00           Oct           101.45           Σ(44)1           132.55           Σ(45)1           19.88                 | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | 31.00<br>2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>157.12<br>1564.86<br>23.57<br>150.00<br>1.39<br>0.54<br>0.75  | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)                 |
| <ul> <li>4. Water heatin</li> <li>Assumed occupa</li> <li>Annual average</li> <li>Hot water usage</li> <li>Energy content of</li> <li>Distribution loss</li> <li>Storage volume</li> <li>Water storage log</li> <li>a) If manufactur</li> <li>Temperature</li> <li>Energy lost fr</li> <li>Enter (50) or (54)</li> <li>Water storage log</li> </ul>                                  | ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>s 0.15 x (45)<br>24.34<br>(litres) inclu<br>oss:<br>rer's declare<br>e factor from<br>rom water s<br>4) in (55)   | 28.00<br>equirement<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>uding any s<br>d loss factor<br>n Table 2b<br>torage (kW   | 31.00         nt         res per day         Mar         ach month         101.45         18 × Vd,m ×         146.43         21.96         olar or WW         or is known         vh/day) (48         umonth (54)   | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>anm x Tm/3<br>127.66<br>19.15<br>/HRS storag<br>(kWh/day)<br>8) x (49)<br>5) x (41)m                                      | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>8600 kWh/m<br>122.49<br>18.37<br>re within sam                                   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>0nth (see<br>105.70<br>15.86<br>ne vessel                                  | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69   | Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86  | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00         Oct         101.45         Σ(44)1         132.55         Σ(45)1         19.88                             | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | 31.00<br>2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>1564.86<br>23.57<br>150.00<br>1.39<br>0.54<br>0.75<br>0.75  | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(47)<br>(49)<br>(50)<br>(55)                                 |
| <ul> <li>4. Water heatin</li> <li>Assumed occupa</li> <li>Annual average</li> <li>Hot water usage</li> <li>Energy content of</li> <li>Distribution loss</li> <li>Storage volume</li> <li>Water storage log</li> <li>a) If manufactur</li> <li>Temperature</li> <li>Energy lost fr</li> <li>Enter (50) or (54)</li> <li>Water storage log</li> </ul>                                  | ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>c 0.15 x (45)<br>24.34<br>(litres) inclu<br>coss:<br>era's declare<br>e factor from<br>rom water s<br>4) in (55)<br>coss calculate<br>23.33                                 | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>rding any s<br>d loss facto<br>n Table 2b<br>torage (kW   | 31.00         nt         res per day '         Mar         ach month         101.45         18 x Vd,m x         146.43         21.96         olar or WW         or is known         vh/day) (48         month (55)         23.33  | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>anm x Tm/3<br>127.66<br>19.15<br>/HRS storag<br>(kWh/day)<br>3) x (49)<br>5) x (41)m                                      | 31.00<br>= (25 x N) +<br>May<br>for from Tabl<br>93.49<br>8600 kWh/m<br>122.49<br>18.37<br>re within sam                                   | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>onth (see<br>105.70<br>15.86<br>ne vessel<br>22.58                         | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69   | Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86  | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00         Oct         101.45         Σ(44)1         132.55         Σ(45)1         19.88                             | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | 31.00<br>2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>157.12<br>1564.86<br>23.57<br>150.00<br>1.39<br>0.54<br>0.75<br>0.75  | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(44)<br>(45)<br>(45)<br>(46)<br>(47)<br>(48)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55) |
| <ul> <li>4. Water heatin</li> <li>Assumed occupa</li> <li>Annual average</li> <li>Hot water usage</li> <li>Energy content of</li> <li>Distribution loss</li> <li>Storage volume</li> <li>Water storage log</li> <li>a) If manufactur</li> <li>Temperature</li> <li>Energy lost fr</li> <li>Enter (50) or (54)</li> <li>Water storage log</li> <li>If the vessel condition</li> </ul> | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>c 0.15 x (45)<br>24.34<br>(litres) inclu<br>oss:<br>rer's declare<br>e factor from<br>rom water s<br>a) in (55)<br>oss calculate<br>23.33<br>tains dedice   | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>uding any s<br>d loss factor<br>n Table 2b<br>torage (kW<br>ed for each<br>21.07<br>ated solar s          | 31.00         nt         res per day         mar         ach month         101.45         18 × Vd,m ×         146.43         21.96         olar or WW         or is known         vh/day) (48         umonth (55         23.33         storage or c                                     | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>anm x Tm/3<br>127.66<br>19.15<br>/HRS storag<br>(kWh/day)<br>8) x (49)<br>8) x (49)<br>5) x (41)m<br>22.58<br>ledicated M | 31.00<br>= (25 x N) +<br>May<br>for from Table<br>93.49<br>3600 kWh/m<br>122.49<br>18.37<br>re within sam<br>23.33<br>(WHRS (56)n          | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>onth (see<br>105.70<br>15.86<br>ne vessel<br>22.58<br>n x [(47) -          | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69<br>14.69<br>23.33<br>Vs] ÷ (47)           | 31.00<br>Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86<br>16.86                                | 30.00<br>Sep<br>97.47<br>113.74<br>17.06          | 31.00<br>Oct<br>101.45<br>Σ(44)1<br>132.55<br>Σ(45)1<br>19.88<br>23.33  | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70              | 31.00<br>2.75<br>99.46<br>Dec<br>109.40<br>1193.50<br>1564.86<br>23.57<br>150.00<br>1.39<br>0.54<br>0.75<br>0.75<br>0.75  | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(47)<br>(49)<br>(50)<br>(55)<br>(55)                         |
| <ul> <li>4. Water heatin</li> <li>Assumed occupa</li> <li>Annual average</li> <li>Hot water usage</li> <li>Energy content of</li> <li>Distribution loss</li> <li>Storage volume</li> <li>Water storage loss</li> <li>a) If manufactur</li> <li>Temperature</li> <li>Energy loss fri</li> <li>Enter (50) or (54)</li> <li>Water storage loss</li> <li>If the vessel con</li> </ul>    | ng energy ro<br>ancy, N<br>hot water u<br>Jan<br>e in litres pe<br>109.40<br>of hot water<br>162.24<br>conto x (45)<br>24.34<br>(litres) inclu<br>coss:<br>rer's declare<br>e factor from<br>rom water s<br>a) in (55)<br>coss calculate<br>23.33<br>ttains dedica | 28.00<br>equiremen<br>sage in litr<br>Feb<br>r day for ea<br>105.43<br>r used = 4.:<br>141.90<br>m<br>21.28<br>uding any s<br>d loss factor<br>n Table 2b<br>torage (kW<br>ed for each<br>21.07<br>ated solar s<br>21.07 | 31.00         nt         res per day         Mar         ach month         101.45         18 x Vd,m x         146.43         21.96         olar or WW         olar or WW         or is known         Vh/day) (48         achorage or c         23.33         storage or c         23.33 | 30.00<br>Vd,average<br><b>Apr</b><br>Vd,m = fact<br>97.47<br>anm x Tm/3<br>127.66<br>19.15<br>/HRS storag<br>(kWh/day)<br>3) x (49)<br>5) x (41)m<br>22.58<br>ledicated W<br>22.58     | 31.00<br>= (25 x N) +<br>May<br>for from Table<br>93.49<br>3600 kWh/m<br>122.49<br>18.37<br>re within sam<br>23.33<br>/WHRS (56)m<br>23.33 | 30.00<br>36<br>Jun<br>le 1c x (43<br>89.51<br>onth (see<br>105.70<br>15.86<br>ne vessel<br>22.58<br>n x [(47) -<br>22.58 | 31.00<br>Jul<br>)<br>89.51<br>Tables 1b,<br>97.95<br>14.69<br>14.69<br>23.33<br>Vs] ÷ (47),<br>23.33 | 31.00<br>Aug<br>93.49<br>1c 1d)<br>112.40<br>16.86<br>16.86<br>23.33<br>else (56)<br>23.33 | 30.00<br>Sep<br>97.47<br>113.74<br>17.06<br>22.58 | 31.00         Oct         101.45         Σ(44)1         132.55         Σ(45)1         19.88         23.33         23.33 | 30.00<br>Nov<br>105.43<br>.12 =<br>144.69<br>.12 =<br>21.70<br><br>22.58 | 31.00         2.75         99.46         Dec         109.40         1193.50         157.12         1564.86         23.57         150.00         1.39         0.54         0.75         0.75         23.33 | (40)<br>(42)<br>(43)<br>(43)<br>(44)<br>(44)<br>(45)<br>(45)<br>(45)<br>(47)<br>(47)<br>(48)<br>(49)<br>(50)<br>(55)<br>(55)<br>(55) |

|   | 23.26  | 21.01   | 23.26  | 22.51  | 23.26   | 22.51  | 23.26   | 23.26  | 22.51   | 23.26  | 22.51  | 23.26 (5   | 9)   |  |  |  |  |  |  |
|---|--|---|--|--|---|--|---|--|---|--|--|--|--|--|--|--|--|--|--|
| Combi loss for e  | ach month  | from Table 3  | 3a. 3b or 3  | с  |   |  |   |  |   |  |  |  | -,   |  |  |  |  |  |  |
|   |  |   | 0.00   | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00   | 0.00 (6  | 1)   |  |  |  |  |  |  |
| Total heat requi  | red for wat  | or beating c  | alculated f  | for each mo  | 0.00  | $(45)m \pm (4)$  | $6)m \pm (57)n$   | 0.00<br>0 ± (59)m ±  | (61)m   | 0.00   | 0.00   | 0.00 (0  | -,   |  |  |  |  |  |  |
| rotal field requi   |  |   | 102.02   |  | 160.00  | 150.70   |   | 159.00   | 150.02  | 170.15   | 100 70   | 202 72 16  | 2)   |  |  |  |  |  |  |
|   | 208.84   | 183.98  | 193.02   | 1/2./5   | 169.09  | 150.79   | 144.54  | 158.99   | 158.83  | 179.15   | 189.78   | 203.72 (6  | 2)   |  |  |  |  |  |  |
| Solar DHW Input   | t calculated   | using Appe  | naix G or A  | Appendix H   |   |  |   |  |   |  |  |  |  |  |  |  |  |  |  |
|   | 0.00   | 0.00  | 0.00   | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00  | 0.00   | 0.00   | 0.00 (6  | 3)   |  |  |  |  |  |  |
| Output from wa  | iter heater f  | or each moi   | nth (kWh/ı   | month) (62   | 2)m + (63)m   | 1  |   |  |   |  |  | ·  |  |  |  |  |  |  |  |
|   | 208.84   | 183.98  | 193.02   | 172.75   | 169.09  | 150.79   | 144.54  | 158.99   | 158.83  | 179.15   | 189.78   | 203.72   |  |  |  |  |  |  |  |
| $\Sigma(64)112 = 2113.48 $ (64) Heat gains from water beating (kW/b/month) 0.25 × [0.85 × (45)m + (51)m] + 0.8 × [(46)m + (57)m + (50)m]  |  |   |  |  |   |  |   |  |   |  |  |  |  |  |  |  |  |  |  |
| Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]   |  |   |  |  |   |  |   |  |   |  |  |  |  |  |  |  |  |  |  |
|   | 91.22  | 80.85   | 85.96  | 78.52  | 78.00   | 71.22  | 69.84   | 74.65  | 73.89   | 81.35  | 84.18  | 89.52 <mark>(6</mark>  | 5)   |  |  |  |  |  |  |
|   |  |   |  |  |   |  |   |  |   |  |  |  |  |  |  |  |  |  |  |
| 5. Internal gain  | าร   |   |  |  |   |  |   |  |   |  |  |  |  |  |  |  |  |  |  |
|   | Jan  | Feb   | Mar  | Apr  | May   | Jun  | Jul   | Aug  | Sep   | Oct  | Nov  | Dec  |  |  |  |  |  |  |  |
| Metabolic gains   | (Table 5)  |   |  |  |   |  |   |  |   |  |  |  |  |  |  |  |  |  |  |
|   | 137.39   | 137.39  | 137.39   | 137.39   | 137.39  | 137.39   | 137.39  | 137.39   | 137.39  | 137.39   | 137.39   | 137.39 <mark>(6</mark>   | 6)   |  |  |  |  |  |  |
| Lighting gains (c   | alculated in   | Appendix L  | , equation   | L9 or L9a),  | also see Ta   | ble 5  |   |  |   |  |  |  |  |  |  |  |  |  |  |
|   | 22.98  | 20.41   | 16.60  | 12.57  | 9.39  | 7.93   | 8.57  | 11.14  | 14.95   | 18.98  | 22.16  | 23.62 (6   | 7)   |  |  |  |  |  |  |
| Appliance gains   | (calculated  | in Appendix   | L, equatio   | on L13 or L1   | L3a), also se   | e Table 5  |   |  |   |  |  |  |  |  |  |  |  |  |  |
|   | 257.77   | 260.45  | 253.71   | 239.36   | 221.24  | 204.22   | 192.85  | 190.17   | 196.91  | 211.26   | 229.38   | 246.40 (6  | 8)   |  |  |  |  |  |  |
| Cooking gains (c  | alculated in   | Appendix L  | . equation   | L15 or L15   | a), also see  | Table 5  |   |  |   |  |  | (  | - /  |  |  |  |  |  |  |
| ee e8 8e (e   | 26.74  | 26.74   | 26 74  | 26.74  | 26 74   | 26.74  | 26.74   | 26.74  | 26.74   | 26.74  | 26.74  | 26.74 6  | 0)   |  |  |  |  |  |  |
| Rump and fap g  | aine (Table I  | <br>  | 30.74  | 50.74  | 50.74   | 30.74  | 30.74   | 30.74  | 30.74   | 30.74  | 30.74  | 50.74 (0   | 9)   |  |  |  |  |  |  |
| Pullip and fall go  |  |   |  |  |   | 2.22   | 0.00  |  | 0.00  |  | 2.22   |  |  |  |  |  |  |  |  |
|   | 3.00   | 3.00  | 3.00   | 3.00   | 3.00  | 3.00   | 3.00  | 3.00   | 3.00  | 3.00   | 3.00   | 3.00 (7  | 0)   |  |  |  |  |  |  |
| -   |  |   |  |  |   |  |   |  |   |  |  |  |  |  |  |  |  |  |  |
| Losses e.g. evap  | oration (Tal   | ole 5)  |  |  |   |  |   |  |   |  |  |  |  |  |  |  |  |  |  |
| Losses e.g. evap  | oration (Tal   | ole 5)<br>-109.91   | -109.91  | -109.91  | -109.91   | -109.91  | -109.91   | -109.91  | -109.91   | -109.91  | -109.91  | -109.91 (7   | 1)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g   | oration (Tal<br>-109.91<br>ains (Table   | ole 5)<br>-109.91<br>5)   | -109.91  | -109.91  | -109.91   | -109.91  | -109.91   | -109.91  | -109.91   | -109.91  | -109.91  | -109.91 (7   | 1)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g   | oration (Tal<br>-109.91<br>gains (Table<br>122.61  | ole 5)<br>-109.91<br>5)<br>120.31   | -109.91<br>115.54  | -109.91  | -109.91<br>104.84   | -109.91<br>98.92   | -109.91<br>93.88  | -109.91  | -109.91<br>102.63   | -109.91<br>109.34  | -109.91<br>116.92  | -109.91 (7<br>120.32 (7  | 1)<br>2)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga  | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m +  | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68  | -109.91<br>115.54<br>8)m + (69)r   | -109.91<br>109.06<br>m + (70)m -   | -109.91<br>104.84<br>+ (71)m + (7   | -109.91<br>98.92<br>72)m   | -109.91<br>93.88  | -109.91<br>100.33  | -109.91   | -109.91<br>109.34  | -109.91<br>116.92  | -109.91 (7<br>120.32 (7  | 1)<br>2)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga  | oration (Tal<br>-109.91<br>;ains (Table<br>122.61<br>ains (66)m +<br>470.58  | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (63<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07   | -109.91<br>109.06<br>m + (70)m -<br>428.20   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70   | -109.91<br>98.92<br>72)m<br>378.28   | -109.91<br>93.88<br>362.51  | -109.91<br>100.33<br>368.86  | -109.91<br>102.63<br>381.70   | -109.91<br>109.34<br>406.80  | -109.91<br>116.92<br>435.67  | -109.91 (7<br>120.32 (7<br>457.56 (7   | 1)<br>2)<br>3)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga  | oration (Tal<br>-109.91<br>;ains (Table<br>122.61<br>ains (66)m +<br>470.58  | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07   | -109.91<br>109.06<br>m + (70)m -<br>428.20   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70   | -109.91<br>98.92<br>72)m<br>378.28   | -109.91<br>93.88<br>362.51  | -109.91<br>100.33<br>368.86  | -109.91<br>102.63<br>381.70   | -109.91<br>109.34<br>406.80  | -109.91<br>116.92<br>435.67  | -109.91 (7<br>120.32 (7<br>457.56 (7   | 1)<br>2)<br>3)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains  | oration (Tal<br>-109.91<br>ains (Table<br>122.61<br>ains (66)m +<br>470.58   | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07   | -109.91<br>109.06<br>m + (70)m -<br>428.20   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70   | -109.91<br>98.92<br>72)m<br>378.28   | -109.91<br>93.88<br>362.51  | -109.91<br>100.33<br>368.86  | -109.91<br>102.63<br>381.70   | -109.91<br>109.34<br>406.80  | -109.91<br>116.92<br>435.67  | -109.91 (7<br>120.32 (7<br>457.56 (7   | 1)<br>2)<br>3)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains  | oration (Tal<br>-109.91<br>;ains (Table<br>122.61<br>ains (66)m +<br>470.58  | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07   | -109.91<br>109.06<br>m + (70)m -<br>428.20   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area   | -109.91<br>98.92<br>72)m<br>378.28   | -109.91<br>93.88<br>362.51  | -109.91<br>100.33<br>368.86  | -109.91<br>102.63<br>381.70   | -109.91<br>109.34<br>406.80  | -109.91<br>116.92<br>435.67  | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains  | 1)<br>2)<br>3)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains  | oration (Tal<br>-109.91<br>;ains (Table<br>122.61<br>ains (66)m +<br>470.58  | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table  | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup>   | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W  | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup>   | -109.91<br>100.33<br>368.86<br>spec<br>or T  | -109.91<br>102.63<br>381.70<br>g<br>ific data<br>able 6b  | -109.91<br>109.34<br>406.80<br>FF<br>specific d<br>or Table  | -109.91<br>116.92<br>435.67  | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W   | 1)<br>2)<br>3)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains  | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m -<br>470.58  | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table  | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6 d  | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup>   | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W  | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup>   | -109.91<br>100.33<br>368.86<br>spec<br>or T  | -109.91<br>102.63<br>381.70<br>g<br>ific data<br>able 6b  | -109.91<br>109.34<br>406.80<br>FF<br>specific d<br>or Table  | -109.91<br>116.92<br>435.67<br>ata<br>6c   | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W   | 1)<br>2)<br>3)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest   | oration (Tal<br>-109.91<br>ains (Table<br>122.61<br>ains (66)m +<br>470.58   | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.77  | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43  | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W  | -109.91<br>93.88<br>362.51<br>ar flux<br>1/m <sup>2</sup>   | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x   | -109.91<br>102.63<br>381.70<br>g<br>ific data<br>able 6b<br>0.63 x  | -109.91<br>109.34<br>406.80<br>FF<br>specific d<br>or Table  | -109.91<br>116.92<br>435.67<br>ata<br>6c<br>=  | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8   | 1)<br>2)<br>3)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast  | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m +<br>470.58  | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7  | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7  | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65  | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>3 x 1<br>x 3  | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x 4<br>6.79 x 4   | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x<br>0.9 x                                    | -109.91<br>102.63<br>381.70<br><b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x                                   | -109.91<br>109.34<br>406.80<br>FF<br>specific d<br>or Table<br>0.70<br>0.70                                      | -109.91<br>116.92<br>435.67<br>ata<br>6c<br>=  | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8<br>108.51 (7  | 1)<br>2)<br>3)<br>1)<br>7)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa   | oration (Tal<br>-109.91<br>ains (Table<br>122.61<br>ains (66)m +<br>470.58<br>470.58   | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39<br>468.39  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7  | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65  | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>3 x 1<br>x 3  | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x (<br>6.79 x (   | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x<br>0.9 x                                    | -109.91<br>102.63<br>381.70<br>g<br>ific data<br>able 6b<br>0.63 x<br>x   | -109.91<br>109.34<br>406.80<br><b>FF</b><br>specific d<br>or Table<br>0.70<br>0.70                               | -109.91<br>116.92<br>435.67<br> ata<br>6c<br>=   | -109.91       (7         120.32       (7         457.56       (7         Gains<br>W       (8         108.51       (7   | 1)<br>2)<br>3)<br>1)<br>7)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa   | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m +<br>470.58<br>470.58<br>470.58  | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39<br>468.39<br>(82)m<br>279.10   | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7<br>422.73  | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [<br>592.27   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65<br>725.90  | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>2 x 1<br>x 3<br>x 3<br>748.15                         | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x 1<br>6.79 x 1<br>709.85                                   | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x<br>0.9 x<br>605.95                          | -109.91<br>102.63<br>381.70<br><b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>480.78                         | -109.91<br>109.34<br>406.80<br><b>FF</b><br>specific d<br>or Table<br>0.70<br>0.70<br>319.48                     | -109.91<br>116.92<br>435.67<br>ata<br>6c<br>= [<br>] = [<br>188.24                         | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8<br>108.51 (7<br>130.68 (8   | 1)<br>2)<br>3)<br>1)<br>7)<br>3)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - inte   | oration (Tal<br>-109.91<br>ains (Table<br>122.61<br>ains (66)m +<br>470.58<br>470.58<br>154.82<br>ernal and so   | ole 5)<br>-109.91<br>5)<br>120.31<br>(67)m + (67)<br>468.39<br>468.39<br>(67)m + (67)<br>(67)m + (67)<br>(67)m + (68)<br>(67)m + (68)<br>(68) (68)<br>(68) (68)<br>(68) (68) (68)<br>(68) (68) (68)<br>(68) (68) (68) (68)<br>(68) (68) (68) (68) (68)<br>(68) (68) (68) (68) (68) (68) (68) (68)   | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7<br>422.73<br>(83)m   | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [<br>592.27   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65<br>725.90  | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>2 x 1<br>3 x 3<br>748.15                              | -109.91<br>93.88<br>362.51<br>ar flux<br>1.28 x<br>6.79 x<br>709.85   | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x<br>0.9 x<br>605.95                          | -109.91<br>102.63<br>381.70<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>480.78                                | -109.91<br>109.34<br>406.80<br><b>FF</b><br>specific d<br>or Table<br>0.70<br>0.70<br>319.48                     | -109.91<br>116.92<br>435.67<br>435.67<br>=   | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8<br>108.51 (7<br>130.68 (8   | <ol> <li>1)</li> <li>2)</li> <li>3)</li> <li>1)</li> <li>7)</li> <li>3)</li> </ol>                                     |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - inte   | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m +<br>470.58<br>470.58<br>470.58<br>154.82<br>ernal and so<br>625.40  | ole 5)<br>-109.91<br>5)<br>120.31<br>(67)m + (67)<br>468.39<br>468.39<br>(468.39<br>279.10<br>lar (73)m +<br>747.49   | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7<br>422.73<br>(83)m<br>875.80   | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>592.27<br>1020.47   | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65<br>725.90<br>1128.60   | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>201<br>X 1<br>X 3<br>748.15<br>1126.43                | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>6.79 x<br>709.85<br>1072.36                            | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x<br>605.95<br>974.81                         | -109.91<br>102.63<br>381.70<br><b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>480.78                         | -109.91<br>109.34<br>406.80<br><b>FF</b><br>specific d<br>or Table<br>0.70<br>0.70<br>319.48                     | -109.91<br>116.92<br>435.67<br><b>ata</b><br><b>6c</b><br>= [<br>188.24<br>623.91          | -109.91       (7         120.32       (7         457.56       (7         Gains       (8         46.31       (8         108.51       (7         130.68       (8         588.24       (8 | <ol> <li>1)</li> <li>2)</li> <li>3)</li> <li>1)</li> <li>7)</li> <li>3)</li> <li>4)</li> </ol>                         |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - inter  | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m +<br>470.58<br>470.58<br>470.58<br>154.82<br>ernal and so<br>625.40  | ble 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (64<br>468.39<br>468.39<br>(82)m<br>279.10<br>lar (73)m +<br>747.49  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7<br>422.73<br>(83)m<br>875.80   | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [<br>592.27<br>1020.47  | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65<br>725.90<br>1128.60   | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>201<br>378.28<br>1126.43                              | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>6.79 x<br>5.79 x<br>709.85<br>1072.36                  | -109.91<br>100.33<br>368.86<br><b>spec</b><br>or T<br>0.9 x (0)<br>0.9 x (0)<br>605.95<br>974.81 | -109.91<br>102.63<br>381.70<br>sfic data<br>able 6b<br>0.63 x<br>0.63 x<br>480.78<br>862.49                           | -109.91<br>109.34<br>406.80<br><b>FF</b><br>specific d<br>or Table<br>0.70<br>0.70<br>319.48                     | -109.91<br>116.92<br>435.67<br><b>ata</b><br><b>6c</b><br>= []<br>188.24<br>623.91         | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8<br>108.51 (7<br>130.68 (8<br>588.24 (8  | <ol> <li>1)</li> <li>2)</li> <li>3)</li> <li>1)</li> <li>7)</li> <li>3)</li> <li>4)</li> </ol>                         |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern  | ernal and so<br>(74)<br>(-109.91)<br>(74)<br>(122.61)<br>(74)<br>(470.58)<br>(470.58)<br>(470.58)<br>(56)<br>(470.58)<br>(56)<br>(74)<br>(154.82)<br>(54.82)<br>(574)<br>(574)<br>(154.82)<br>(574)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)    | ole 5)<br>-109.91<br>5)<br>120.31<br>(67)m + (68<br>468.39<br>(67)m + (68<br>468.39<br>279.10<br>lar (73)m +<br>747.49<br>ture (heating)  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.77<br>0.77<br>422.73<br>(83)m<br>875.80<br>g season)  | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [<br>592.27<br>1020.47  | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65<br>725.90<br>1128.60   | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>200<br>378.28<br>1126.43                              | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>6.79 x<br>6.79 x<br>709.85<br>1072.36                  | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x 0<br>605.95<br>974.81                       | -109.91<br>102.63<br>381.70<br><b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>480.78<br>862.49               | -109.91<br>109.34<br>406.80<br><b>FF</b><br>specific d<br>or Table<br>0.70<br>0.70<br>319.48<br>726.28           | -109.91<br>116.92<br>435.67<br>ata<br>6c<br>= [<br>188.24<br>623.91                        | -109.91       (7         120.32       (7         457.56       (7         Gains       (8         108.51       (7         130.68       (8         588.24       (8                        | <ol> <li>1)</li> <li>2)</li> <li>3)</li> <li>1)</li> <li>7)</li> <li>3)</li> <li>4)</li> </ol>                         |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - intern<br>Temperature du                                       | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m +<br>470.58<br>470.58<br>470.58<br>154.82<br>ernal and so<br>625.40<br>hal temperation   | ble 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (64<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.39<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>468.49<br>4 | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>(33)m<br>875.80<br>ng season)<br>the living a  | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [<br>592.27<br>1020.47<br>area from T                                 | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65<br>725.90<br>1128.60<br>able 9, Th1                                  | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>378.15<br>1126.43<br>(°C)                             | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x 1<br>6.79 x 1<br>709.85<br>1072.36                        | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x (0)<br>0.9 x (0)<br>605.95<br>974.81        | -109.91<br>102.63<br>381.70<br><b>g</b><br><b>ific data</b><br><b>able 6b</b><br>0.63 x<br>0.63 x<br>480.78<br>862.49 | -109.91<br>109.34<br>406.80<br>FF<br>specific d<br>or Table<br>0.70<br>0.70<br>319.48                            | -109.91<br>116.92<br>435.67<br><b>ata</b><br><b>6c</b><br>= [<br>] = [<br>188.24<br>623.91 | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8<br>108.51 (7<br>130.68 (8<br>588.24 (8<br>588.24 (8<br>21.00 (8   | <ol> <li>1)</li> <li>2)</li> <li>3)</li> <li>1)</li> <li>7)</li> <li>3)</li> <li>4)</li> <li>5)</li> </ol>             |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern<br>Temperature du                      | ernal and so<br>(5.4)<br>(122.61)<br>(122.61)<br>(122.61)<br>(470.58)<br>(470.58)<br>(470.58)<br>(154.82)<br>(154.82)<br>(625.40)<br>(625.40)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154.82)<br>(154. | ole 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39<br>468.39<br>(82)m<br>279.10<br>lar (73)m +<br>747.49<br>ture (heating<br>g periods in<br>Feb  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.77<br>0.77<br>422.73<br>(83)m<br>875.80<br>ng season)<br>the living a<br>Mar                              | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [<br>592.27<br>1020.47<br>area from T<br>Apr                          | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br><b>Area</b><br>m <sup>2</sup><br>13.43<br>9.65<br>725.90<br>1128.60<br>1128.60<br>Sable 9, Th1<br>May        | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>200<br>378.28<br>1126.43<br>(°C)<br>Jun               | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>6.79 x<br>6.79 x<br>709.85<br>1072.36                  | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x 0<br>605.95<br>974.81<br>Aug                | -109.91<br>102.63<br>381.70<br>g<br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>480.78<br>862.49<br>Sep               | -109.91<br>109.34<br>406.80<br>FF<br>specific d<br>or Table<br>0.70<br>0.70<br>319.48<br>726.28                  | -109.91<br>116.92<br>435.67<br>435.67<br>ata<br>6c<br>= [<br>188.24<br>623.91<br>Kov       | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8<br>108.51 (7<br>130.68 (8<br>588.24 (8<br>588.24 (8<br>21.00 (8<br>Dec  | <ol> <li>1)</li> <li>2)</li> <li>3)</li> <li>1)</li> <li>7)</li> <li>3)</li> <li>4)</li> <li>5)</li> </ol>             |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>SouthEast<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern<br>Temperature du<br>Utilisation facto | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m +<br>470.58<br>470.58<br>154.82<br>ernal and so<br>625.40<br>hal tempera<br>uring heating<br>Jan<br>r for gains f  | ble 5)<br>-109.91<br>5)<br>120.31<br>+ (67)m + (68<br>468.39<br>468.39<br>468.39<br>279.10<br>1ar (73)m +<br>747.49<br>ture (heating gperiods in<br>Feb<br>or living are  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7<br>0.7<br>0.7<br>(83)m<br>875.80<br>ng season)<br>the living a<br>Mar<br>a n1,m (se              | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [<br>7 x [<br>592.27<br>1020.47<br>area from T<br>Apr<br>re Table 9a) | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br>Area<br>m <sup>2</sup><br>13.43<br>9.65<br>725.90<br>1128.60<br>1128.60<br>Sable 9, Th1<br>May               | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>W<br>200<br>1126.43<br>(°C)<br>Jun                         | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x 1<br>6.79 x 1<br>6.79 x 1<br>709.85<br>1072.36            | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x ()<br>0.9 x ()<br>605.95<br>974.81<br>Aug   | -109.91<br>102.63<br>381.70<br><b>g</b><br>ific data<br>able 6b<br>0.63 x<br>0.63 x<br>480.78<br>862.49<br>Sep        | -109.91<br>109.34<br>406.80<br>FF<br>specific d<br>or Table<br>0.70<br>0.70<br>319.48<br>726.28                  | -109.91<br>116.92<br>435.67<br>435.67<br>ata<br>6c<br>= [<br>188.24<br>623.91<br>Nov       | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8<br>108.51 (7<br>130.68 (8<br>588.24 (8<br>588.24 (8<br>21.00 (8<br>Dec  | 1)<br>2)<br>3)<br>1)<br>7)<br>3)<br>4)<br>5)   |  |  |  |  |  |  |
| Losses e.g. evap<br>Water heating g<br>Total internal ga<br>6. Solar gains<br>NorthWest<br>Solar gains in wa<br>Total gains - inter<br>7. Mean intern<br>Temperature du<br>Utilisation factor             | oration (Tal<br>-109.91<br>gains (Table<br>122.61<br>ains (66)m +<br>470.58<br>470.58<br>470.58<br>154.82<br>ernal and so<br>625.40<br>hal tempera<br>arring heating<br>Jan<br>r for gains fr<br>1.00  | ole 5)<br>-109.91<br>5)<br>120.31<br>(67)m + (67)<br>(67)m + (67)m + (67)<br>(67)m + (67)m + (77)m + (  | -109.91<br>115.54<br>8)m + (69)n<br>453.07<br>Access f<br>Table<br>0.7<br>0.7<br>422.73<br>(83)m<br>875.80<br>95.80<br>10 season)<br>the living a<br>Mar<br>a n1,m (se<br>0.98 | -109.91<br>109.06<br>m + (70)m -<br>428.20<br>factor<br>6d<br>7 x [<br>7 x [<br>592.27<br>1020.47<br>area from T<br>Apr<br>re Table 9a)<br>0.94  | -109.91<br>104.84<br>+ (71)m + (7<br>402.70<br><b>Area</b><br>m <sup>2</sup><br>13.43<br>9.65<br>725.90<br>1128.60<br>1128.60<br>able 9, Th1<br>May<br>0.83 | -109.91<br>98.92<br>72)m<br>378.28<br>Sola<br>V<br>378.28<br>Sola<br>V<br>1126.43<br>(°C)<br>Jun<br>0.65 | -109.91<br>93.88<br>362.51<br>ar flux<br>//m <sup>2</sup><br>1.28 x<br>1.28 x<br>6.79 x<br>5.709.85<br>1072.36<br>Jul<br>0.49 | -109.91<br>100.33<br>368.86<br>spec<br>or T<br>0.9 x<br>605.95<br>974.81<br>Aug<br>0.55          | -109.91<br>102.63<br>381.70<br>g<br>ific data<br>able 6b<br>0.63 x<br>480.78<br>862.49<br>Sep<br>0.82                 | -109.91<br>109.34<br>406.80<br><b>FF</b><br>specific d<br>or Table<br>0.70<br>0.70<br>319.48<br>726.28<br>726.28 | -109.91<br>116.92<br>435.67<br>435.67<br>188.24<br>623.91<br>188.24<br>623.91<br>Nov       | -109.91 (7<br>120.32 (7<br>457.56 (7<br>Gains<br>W<br>46.31 (8<br>108.51 (7<br>130.68 (8<br>588.24 (8<br>21.00 (8<br>Dec (8  | <ol> <li>1)</li> <li>2)</li> <li>3)</li> <li>1)</li> <li>7)</li> <li>3)</li> <li>4)</li> <li>5)</li> <li>6)</li> </ol> |  |  |  |  |  |  |

|   | 19.67  | 19.85  | 20.14  | 20.52                            | 20.82                            | 20.96                                  | 20.99                          | 20.99                          | 20.88   | 20.48   | 20.01   | 19.64  | (87)   |
|---|--|--|--|----------------------------------|----------------------------------|--|--------------------------------|--------------------------------|---|---|---|--|--|
| Temperature du  | ring heating   | g periods in   | the rest of  | dwelling fr                      | om Table 9                       | , Th2(°C)                              |                                |                                |   |   |   |  |  |
| ·   | 19.89  | 19.90  | 19.90  | 19.91                            | 19.91                            | 19.92                                  | 19.92                          | 19.93                          | 19.92   | 19.91   | 19.91   | 19.90  | (88)   |
| Utilisation factor  | for gains for  | or rest of d   | welling n2,  | m                                |                                  |  |                                |                                |   |   | 1   | 1  | ], ,   |
|   | 1.00   | 0.99   | 0.98   | 0.92                             | 0.78                             | 0.55                                   | 0.37                           | 0.43                           | 0.74  | 0.96  | 0.99  | 1.00   | (89)   |
| Mean internal te  | mperature  | in the rest  | of dwelling  | T2 (follow                       | steps 3 to                       | 7 in Table 9                           | )<br>()                        |                                |   |   |   |  | ] ( )  |
|   | 18 13  | 18.40  | 18.82  | 19 36                            | 19 74                            | 19 90                                  | 19.92                          | 19.92                          | 19.83   | 19 32   | 18.63   | 18.09  | (90)   |
| Living area fracti  | on   | 10.40  | 10.02  | 19.50                            | 15.74                            | 19.90                                  | 13.52                          | 15.52                          | 15.05   | ving area ÷   | (4) =   | 0.33   | (91)   |
| Mean internal te  | mperature  | for the wh   | ole dwellin  | g fl A x T1 +                    | ·(1 - fl A) x T                  | 2                                      |                                |                                |   |   | (.)   | 0.00   | ] (31)   |
|   | 18.64  | 18.88  | 10.26  | 10.75                            | 20.10                            | 20.25                                  | 20.28                          | 20.27                          | 20.18   | 19.70   | 10.00   | 18.61  | (02)   |
| Apply adjustmen   | t to the me  | 10.00  | 19.20  | 19.75                            | 20.10                            | 20.25                                  | 20.20                          | 20.27                          | 20.18   | 19.70   | 19.09   | 18.01  | [(92)  |
|   |  | 10.00  |  |                                  |                                  |  |                                | 20.27                          | 20.19   | 10.70   | 10.00   | 19.61  |  |
|   | 18.64  | 18.88  | 19.26  | 19.75                            | 20.10                            | 20.25                                  | 20.28                          | 20.27                          | 20.18   | 19.70   | 19.09   | 18.61  | [ (93)   |
| 8. Space heatin   | g requirem   | ent  |  |                                  |                                  |  |                                |                                |   |   |   |  |  |
|   | Jan  | Feb  | Mar  | Apr                              | May                              | Jun                                    | Jul                            | Aug                            | Sep   | Oct   | Nov   | Dec  |  |
| Utilisation factor  | for gains, r   | յՠ   |  |                                  |                                  |  |                                |                                |   |   |   |  |  |
|   | 1.00   | 0.99   | 0.97   | 0.92                             | 0.79                             | 0.58                                   | 0.41                           | 0.47                           | 0.76  | 0.95  | 0.99  | 1.00   | (94)   |
| Useful gains. nm  | Gm. W (94  | )m x (84)m   |  |                                  |                                  |  |                                |                                |   |   |   |  |  |
| 0,1,1   | 622.61   | 739 71   | 851 59   | 935 37                           | 886 90                           | 656 93                                 | 439 81                         | 459.48                         | 653 21  | 690 94  | 618.04  | 586.26   | (95)   |
| Monthly average   | external te  | emperature   | from Tabl  | e     1                          | 000.50                           | 000.00                                 | 155101                         | 155.10                         | 000.21  | 030.31  | 010.01  | 500.20   | ] (33)   |
| wonting average   | 4 30   | 1 90   | 6 50   | 8 90                             | 11 70                            | 14 60                                  | 16.60                          | 16.40                          | 14.10   | 10.60   | 7 10  | 4 20   | (96)   |
| Heat loss rate fo   | r mean inte  | rnal temne   | orature Im   | 0.90                             | v [(93)m - [                     | (96)ml                                 | 10.00                          | 10.40                          | 14.10   | 10.00   | 7.10  | 4.20   | ] (30)   |
|   | 1701 00  | 1722.40  | 1577 54  | 1225 16                          | 1022 70                          | 691 AE                                 | 442.24                         | 466.21                         | 725.60  | 1100 52   | 1467 51   | 1772.20  | (07)   |
| Space boating re  | auiromont  | 1/52.40  | 1577.54  | [(07)m]                          | 1025.79                          | 001.45                                 | 445.54                         | 400.21                         | 755.00  | 1109.55   | 1407.51   | 1772.20  | ] (97)   |
| Space heating re  |  | cc7.00   | 540 11   |                                  |                                  | 0.00                                   | 0.00                           | 0.00                           | 0.00  | 211.42  | C11 C2  | 002.24   | 1  |
|   | 002.45   | 007.09   | 540.11   | 260.05                           | 101.64                           | 0.00                                   | 0.00                           | 0.00                           | 0.00  | )1 5 10   | 12  | 002.34   |  |
| Contraction of the second   |  | LAN 1  |  |                                  |                                  |  |                                |                                | Σ(98  | (00)  | 12 = 4  | 42.20  | ] (98)<br>] (98)   |
| Space neating re  | quirement  | kwn/m²/ye  | ear  |                                  |                                  |  |                                |                                |   | (98)  | ÷ (4)   | 42.20  | (99)   |
| 9a. Energy requ   | irements -   | individual   | heating sv   |                                  | ding micro                       |  |                                |                                |   |   |   |  |  |
| Course harding  |  |  | nearing sys  | stems inclu                      | ung micro                        | -CHP                                   |                                |                                |   |   |   |  |  |
| Space neating   |  |  | nearing sy.  | stems inclu                      |                                  | -CHP                                   |                                |                                |   |   |   |  |  |
| Fraction of space   | e heat from  | secondary  | /suppleme  | ntary system                     | n (table 11                      | -CHP                                   |                                |                                |   |   |   | 0.00   | (201)  |
| Fraction of space   | e heat from<br>e heat from   | secondary,<br>main syste   | /supplemei<br>m(s)   | ntary system                     | m (table 11                      | -CHP<br>)                              |                                |                                |   | 1 - (2)   | 01) =   | 0.00   | ) (201)<br>(202)   |
| Fraction of space<br>Fraction of space<br>Fraction of space   | e heat from<br>heat from<br>heat from  | secondary,<br>main syste<br>main syste   | /supplemen<br>m(s)<br>m 2  | ntary system                     | m (table 11                      | -CHP<br>)                              |                                |                                |   | 1 - (20   | 01) =   | 0.00 1.00 0.00   | ) (201)<br>) (202)<br>) (202)  |
| Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of space  | e heat from<br>e heat from<br>e heat from<br>space heat  | secondary,<br>main syste<br>main syste<br>from main  | /supplemen<br>m(s)<br>m 2<br>system 1  | ntary system                     | m (table 11                      | -CHP<br>)                              |                                |                                | (20   | 1 - (2(<br>)2) x [1- (20  | 01) =   | 0.00 1.00 0.00 1.00  | ) (201)<br>) (202)<br>) (202)<br>) (202)   |
| Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total   | e heat from<br>e heat from<br>e heat from<br>space heat  | secondary,<br>main syste<br>main syste<br>from main<br>from main   | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2  | ntary system                     | m (table 11                      | )<br>)                                 |                                |                                | (20   | 1 - (20<br>)2) x [1- (20<br>(202) x (20   | D1) =<br>3)] =  | 0.00<br>1.00<br>0.00<br>1.00   | ) (201)<br>(202)<br>(202)<br>(202)<br>(204)  |
| Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Fraction of total  | e heat from<br>e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1  | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)  | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2  | ntary system                     | m (table 11                      | -CHP<br>)                              |                                |                                | (20   | 1 - (20<br>)2) x [1- (20<br>(202) x (20   | D1) =<br>3)] =<br>D3) =   | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>93 50  | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)   |
| Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai  | e heat from<br>e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1  | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br><b>Eeb</b>  | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br>Mar   | ntary system                     | m (table 11                      | )                                      |                                | Διισ                           | (20<br>Sen  | 1 - (2(<br>)2) x [1- (20<br>(202) x (2(<br>Oct  | 01) =<br>3)] =<br>03) =<br>Nov  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>93.50  | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai  | e heat from<br>e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan   | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb   | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br>Mar<br>(b/month                                     | ntary system                     | m (table 11                      | Jun                                    | Jul                            | Aug                            | (20<br>Sep  | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b>   | 01) =<br>3)] =<br>03) =<br>Nov  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>93.50<br>Dec   | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu  | e heat from<br>e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys   | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW                                      | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month                              | Apr                              | m (table 11<br>May               | Jun                                    | Jul                            | Aug                            | (20<br>Sep  | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br>Oct  | D1) =<br>3)] =<br>D3) =<br>Nov  | 0.00<br>1.00<br>0.00<br>1.00<br>93.50<br>Dec   | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)   |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu   | e heat from<br>e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39   | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>713.46                            | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month<br>577.66                    | Apr<br>300.16                    | May                              | Jun<br>0.00                            | Jul<br>0.00                    | <b>Aug</b>                     | (20<br><b>Sep</b>                                     | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>333.08   | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14  | 0.00<br>1.00<br>0.00<br>1.00<br>0.00<br>93.50<br>Dec<br>943.68                                   | ) (201)<br>) (202)<br>) (202)<br>) (204)<br>] (205)<br>] (206)   |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu   | e heat from<br>e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39   | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>713.46                            | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month<br>577.66                    | Apr<br>300.16                    | m (table 11<br>May<br>108.92     | Jun<br>0.00                            | <b>Jul</b><br>0.00             | <b>Aug</b>                     | (20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br><u>333.08</u><br>1)15, 10                          | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>.12 =4                                  | 0.00<br>1.00<br>0.00<br>1.00<br>93.50<br><b>Dec</b><br>943.68                                    | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>]<br>] (211)   |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu   | e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39  | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br><b>Feb</b><br>stem 1), kW<br>713.46                     | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month<br>577.66                    | Apr<br>300.16                    | May<br>108.92                    | Jun<br>0.00                            | Jul<br>00.0                    | <b>Aug</b>                     | (20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br><u>333.08</u><br>1)15, 10                          | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>.12 =4                                  | 0.00<br>1.00<br>0.00<br>1.00<br>93.50<br>Dec<br>943.68<br>943.68                                 | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (206)  |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat   | e heat from<br>e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39<br>er heater                                    | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>713.46                            | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month<br>577.66                    | Apr<br>300.16                    | May<br>108.92                    | Jun<br>0.00                            | <b>Jul</b><br>0.00             | <b>Aug</b>                     | (20<br><b>Sep</b><br>0.00<br>Σ(21:                    | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>3333.08<br>1)15, 10                                | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>.12 =4                                  | 0.00<br>1.00<br>0.00<br>1.00<br>93.50<br>Dec<br>943.68<br>1553.49                                | ) (201)<br>(202)<br>(202)<br>(204)<br>(205)<br>(206)<br>(206)  |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat   | e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39<br>er heater<br>88.19  | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br><b>Feb</b><br>stem 1), kW<br>713.46                     | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month<br>577.66                    | Apr<br>300.16                    | May<br>108.92                    | Jun<br>0.00<br>79.80                   | <b>Jul</b><br>0.00<br>79.80    | Aug<br>0.00<br>79.80           | (20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.80           | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>3333.08<br>1)15, 10                                | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>.12 =4<br>87.71                         | 0.00<br>1.00<br>0.00<br>1.00<br>93.50<br>Dec<br>943.68<br>1553.49<br>88.28                       | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (211)<br>] (217)                                       |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat   | e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39<br>er heater<br>88.19<br>rel, kWh/mi                           | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>713.46<br>87.95<br>onth           | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month<br>577.66                    | Apr<br>300.16<br>86.10           | May<br>108.92                    | Jun<br>0.00<br>79.80                   | <b>Jul</b><br>0.00<br>79.80    | Aug<br>0.00<br>79.80           | (20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.80           | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>3333.08<br>1)15, 10<br>86.28                       | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>12 =4<br>87.71                          | 0.00<br>1.00<br>0.00<br>1.00<br>93.50<br>Dec<br>943.68<br>1553.49<br>88.28                       | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (206)<br>] (211)<br>] (211)                                       |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat   | e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39<br>er heater<br>88.19<br>el, kWh/m<br>236.79                   | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>713.46<br>87.95<br>onth<br>209.19 | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month<br>577.66<br>87.41<br>220.81 | Apr<br>300.16<br>86.10<br>200.64 | May<br>108.92<br>83.51           | Jun<br>0.00<br>79.80<br>188.96         | Jul<br>0.00<br>79.80<br>181.13 | Aug<br>0.00<br>79.80<br>199.24 | (20<br>Sep<br>0.00<br>Σ(21:<br>79.80<br>199.03        | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br>Oct<br>3333.08<br>1)15, 10<br>86.28<br>207.64                    | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>12 =4<br>87.71<br>216.36                | 0.00<br>1.00<br>0.00<br>1.00<br>93.50<br>Dec<br>943.68<br>943.68<br>88.28<br>88.28               | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (205)<br>] (206)<br>] (211)<br>] (211)                            |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat   | e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39<br>er heater<br>88.19<br>rel, kWh/mi<br>236.79                 | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>713.46<br>87.95<br>onth<br>209.19 | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br>Mar<br>/h/month<br>577.66<br>87.41<br>220.81        | Apr<br>300.16<br>86.10<br>200.64 | May<br>108.92<br>83.51           | Jun<br>0.00<br>79.80<br>188.96         | Jul<br>0.00<br>79.80<br>181.13 | Aug<br>0.00<br>79.80<br>199.24 | (20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.80<br>199.03 | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>3333.08<br>1)15, 10<br>86.28<br>207.64<br>Σ(219a)1 | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>12 =4<br>87.71<br>216.36<br>.12 =2      | 0.00<br>1.00<br>0.00<br>93.50<br>Dec<br>943.68<br>553.49<br>88.28<br>88.28<br>230.76<br>493.03   | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (205)<br>] (206)<br>] (211)<br>] (211)<br>] (217)<br>] (219)      |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mai<br>Space heating fu<br>Water heating<br>Efficiency of wat<br>Water heating fu                                       | e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39<br>er heater<br>88.19<br>eel, kWh/m<br>236.79                  | secondary,<br>main syste<br>main syste<br>from main<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>713.46<br>87.95<br>onth<br>209.19 | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br><b>Mar</b><br>/h/month<br>577.66<br>87.41<br>220.81 | Apr<br>300.16<br>86.10<br>200.64 | May<br>108.92<br>83.51<br>202.47 | -CHP<br>Jun<br>0.00<br>79.80<br>188.96 | Jul<br>0.00<br>79.80<br>181.13 | Aug<br>0.00<br>79.80<br>199.24 | (20<br>Sep<br>0.00<br>Σ(21:<br>79.80<br>199.03        | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>3333.08<br>1)15, 10<br>86.28<br>207.64<br>Σ(219a)1 | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>12 =4<br>87.71<br>216.36<br>.12 =2      | 0.00<br>1.00<br>0.00<br>93.50<br>Dec<br>943.68<br>943.68<br>553.49<br>88.28<br>230.76<br>2493.03 | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (205)<br>] (206)<br>] (211)<br>] (211)<br>] (217)<br>] (219)      |
| Space neating<br>Fraction of space<br>Fraction of space<br>Fraction of space<br>Fraction of total<br>Fraction of total<br>Efficiency of mail<br>Space heating fu<br>Water heating<br>Efficiency of wat<br>Water heating fu<br>Annual totals<br>Space heating fu | e heat from<br>e heat from<br>space heat<br>space heat<br>n system 1<br>Jan<br>el (main sys<br>922.39<br>er heater<br>88.19<br>nel, kWh/mo<br>236.79<br>el - main sy | secondary,<br>main syste<br>main syste<br>from main<br>(%)<br>Feb<br>stem 1), kW<br>713.46<br>87.95<br>onth<br>209.19<br>stem 1    | /supplemen<br>m(s)<br>m 2<br>system 1<br>system 2<br>Mar<br>/h/month<br>577.66<br>87.41<br>220.81        | Apr<br>300.16<br>86.10<br>200.64 | May<br>108.92<br>83.51           | Jun<br>0.00<br>79.80<br>188.96         | Jul<br>0.00<br>79.80<br>181.13 | Aug<br>0.00<br>79.80<br>199.24 | (20<br><b>Sep</b><br>0.00<br>Σ(21:<br>79.80<br>199.03 | 1 - (20<br>)2) x [1- (20<br>(202) x (20<br><b>Oct</b><br>3333.08<br>1)15, 10<br>86.28<br>207.64<br>Σ(219a)1 | 01) =<br>3)] =<br>03) =<br>Nov<br>654.14<br>12 =4<br>87.71<br>216.36<br>.12 =2<br>4 | 0.00<br>1.00<br>0.00<br>93.50<br>Dec<br>943.68<br>553.49<br>88.28<br>230.76<br>493.03            | ] (201)<br>] (202)<br>] (202)<br>] (204)<br>] (205)<br>] (205)<br>] (206)<br>] (210)<br>] (211)<br>] (217)<br>] (219)<br>] |

| Water heating fuel  |   |   |  |   | 2493.03  |   |
|---|---|---|--|---|--|---|
| Electricity for pumps, fans and electric keep-hot (Table 4f)  |   |   |  |   |  |   |
| central heating pump or water pump within warm air heatin   | g unit  |   | 30.00  |   |  | (230c)  |
| boiler flue fan   |   |   | 45.00  |   |  | (230e)  |
| Total electricity for the above, kWh/year   |   |   |  |   | 75.00  | (231)   |
| Electricity for lighting (Appendix L)   |   |   |  |   | 405.85   | (232)   |
| Total delivered energy for all uses   |   | (211                                      | 1)(221) + (231) + (  | (232)(237b) =   | 7527.37  | (238)   |
|   |   | <b>\</b>                                  | -,(, (,  | (,()  |  | ] (/  |
| 10a. Fuel costs - individual heating systems including micro-C  | НР  |   |  |   |  |   |
|   | Fuel<br>kWh/year  |   | Fuel price   |   | Fuel<br>cost £/year  |   |
| Space heating - main system 1   | 4553.49   | х   | 3.48   | x 0.01 =  | 158.46   | (240)   |
| Water heating   | 2493.03   | x   | 3.48   | x 0.01 =  | 86.76  | (247)   |
| Pumps and fans  | 75.00   | x   | 13.19  | x 0.01 =  | 9.89   | (249)   |
| Electricity for lighting  | 405.85  | x   | 13.19  | x 0.01 =  | 53.53  | (250)   |
| Additional standing charges   |   |   |  |   | 120.00   | (251)   |
| Total energy cost   |   |   | (240)(242) +   | - (245)(254) =  | 428.64   | (255)   |
| 11a. SAP rating - individual heating systems including micro-C  | СНР   |   |  |   |  |   |
| Energy cost deflator (Table 12)   |   |   |  |   | 0.42   | (256)   |
| Energy cost factor (ECF)  |   |   |  |   | 1.23   | (257)   |
| SAP value   |   |   |  |   | 82.79  | ]   |
| SAP rating (section 13)   |   |   |  |   | 83   | (258)   |
| SAP band  |   |   |  |   | В  | ]   |
|   |   |   |  |   |  | -   |
|   |   |   |  |   |  |   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic   | ro-CHP  |   |  |   |  |   |
| 12a. CO₂ emissions - individual heating systems including mic   | Energy<br>kWh/year  |   | Emission factor<br>kg CO₂/kWh  |   | Emissions<br>kg CO <sub>2</sub> /year  | _   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1  | Energy<br>kWh/year<br>4553.49   | x   | Emission factor<br>kg CO₂/kWh  | =   | Emissions<br>kg CO₂/year<br>983.55   | ] (261)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating   | Energy<br>kWh/year<br>4553.49<br>2493.03  | x<br>x                                    | Emission factor<br>kg CO <sub>2</sub> /kWh   | =<br>=  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50  | ] (261)<br>] (264)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating  | Energy<br>kWh/year<br>4553.49<br>2493.03  | x<br>x                                    | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +  | =<br>=<br>(263) + (264) =   | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05   | ] (261)<br>] (264)<br>] (265)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans  | Energy<br>kWh/year<br>4553.49<br>2493.03<br>75.00   | x<br>x<br>x                               | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52  | =<br>=<br>(263) + (264) =<br>=  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93  | ] (261)<br>] (264)<br>] (265)<br>] (267)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting  | Energy           kWh/year           4553.49           2493.03           75.00           405.85                    | x<br>x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52  | =<br>=<br>(263) + (264) =<br>=<br>=   | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64  | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)   |
| 12a. CO₂ emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO₂, kg/year  | Energy<br>kWh/year<br>4553.49<br>2493.03<br>75.00<br>405.85   | x<br>x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =   | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate   | Energy         kWh/year         4553.49         2493.03         75.00         405.85                              | x<br>x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>0.22<br>(261) + (262) +<br>0.52<br>0.52  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56  | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)   |
| 12a. $CO_2$ emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total $CO_2$ , kg/year<br>Dwelling $CO_2$ emission rate<br>El value  | Energy<br>kWh/year<br>4553.49<br>2493.03<br>75.00<br>405.85   | x<br>x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)   | Energy<br>kWh/year<br>4553.49<br>2493.03<br>75.00<br>405.85   | x<br>x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84   | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>]<br>] (274)   |
| 12a. $CO_2$ emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total $CO_2$ , kg/year<br>Dwelling $CO_2$ emission rate<br>El value<br>El rating (section 14)<br>El band   | Energy<br>kWh/year<br>4553.49<br>2493.03<br>75.00<br>405.85   | x<br>x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B  | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>]<br>] (274)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band<br>13a. Primary energy - individual heating systems including mic  | Energy<br>kWh/year<br>4553.49<br>2493.03<br>75.00<br>405.85   | x<br>x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B  | ] (261)<br>(264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>] (274)  |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band<br>13a. Primary energy - individual heating systems including mi   | Energy         kWh/year         4553.49         2493.03         75.00         405.85                              | x<br>x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B  | ) (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>(273)<br>(274)   |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band<br>13a. Primary energy - individual heating systems including mi   | Energy<br>kWh/year<br>4553.49<br>2493.03<br>75.00<br>405.85<br>405.85   | x<br>x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>Primary factor  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B<br>Primary Energy<br>kWh/year  | ] (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>] (274)  |
| <ul> <li>12a. CO<sub>2</sub> emissions - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> <li>Space and water heating</li> <li>Pumps and fans</li> <li>Electricity for lighting</li> <li>Total CO<sub>2</sub>, kg/year</li> <li>Dwelling CO<sub>2</sub> emission rate</li> <li>El value</li> <li>El rating (section 14)</li> <li>El band</li> <li>13a. Primary energy - individual heating systems including mic</li> </ul>  | Energy         kWh/year         4553.49         2493.03         75.00         405.85                              | x<br>x<br>x<br>x                          | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>Primary factor<br>1.22  | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B<br>Primary Energy<br>kWh/year<br>5555.25   | ) (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>(273)<br>(274)   |
| <ul> <li>12a. CO<sub>2</sub> emissions - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> <li>Space and water heating</li> <li>Pumps and fans</li> <li>Electricity for lighting</li> <li>Total CO<sub>2</sub>, kg/year</li> <li>Dwelling CO<sub>2</sub> emission rate</li> <li>El value</li> <li>El rating (section 14)</li> <li>El band</li> <li>13a. Primary energy - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> </ul>  | Energy         kWh/year         4553.49         2493.03         75.00         405.85                              | x<br>x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>Primary factor<br>1.22<br>1.22                                    | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =<br>=<br>=  | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B<br>Primary Energy<br>kWh/year<br>5555.25<br>3041.50  | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (272)<br>] (273)<br>] (274)<br>] (274)<br>] (261)<br>] (261)                                  |
| <ul> <li>12a. CO<sub>2</sub> emissions - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> <li>Space and water heating</li> <li>Pumps and fans</li> <li>Electricity for lighting</li> <li>Total CO<sub>2</sub>, kg/year</li> <li>Dwelling CO<sub>2</sub> emission rate</li> <li>El value</li> <li>El rating (section 14)</li> <li>El band</li> <li>13a. Primary energy - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> <li>Space and water heating</li> </ul>   | Energy         kWh/year         4553.49         2493.03         75.00         405.85                              | x<br>x<br>x<br>x<br>x                     | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52<br>Primary factor<br>1.22<br>1.22<br>(261) + (262) +         | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =<br>=<br>=<br>=<br>(263) + (264) =                | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B<br>Primary Energy<br>kWh/year<br>5555.25<br>3041.50<br>8596.76   | ) (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>(273)<br>(274)<br>(274)<br>(274)<br>(261)<br>(261)<br>(264)<br>(265)                             |
| <ul> <li>12a. CO<sub>2</sub> emissions - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> <li>Space and water heating</li> <li>Pumps and fans</li> <li>Electricity for lighting</li> <li>Total CO<sub>2</sub>, kg/year</li> <li>Dwelling CO<sub>2</sub> emission rate</li> <li>El value</li> <li>El rating (section 14)</li> <li>El band</li> <li>13a. Primary energy - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> <li>Space and water heating</li> <li>Pumps and fans</li> </ul>                                   | Energy<br>kWh/year<br>4553.49<br>2493.03<br>75.00<br>405.85<br>405.85<br>Energy<br>kWh/year<br>4553.49<br>2493.03 | x<br>x<br>x<br>x<br>x<br>x                | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>Primary factor<br>1.22<br>(261) + (262) +<br>3.07                 | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =<br>=<br>=<br>(263) + (264) =<br>=                | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B<br>Primary Energy<br>kWh/year<br>5555.25<br>3041.50<br>8596.76<br>230.25                                 | ) (261)<br>(264)<br>(265)<br>(267)<br>(268)<br>(272)<br>(273)<br>(273)<br>(274)<br>(274)<br>(274)<br>(261)<br>(264)<br>(265)<br>(267)                             |
| <ul> <li>12a. CO<sub>2</sub> emissions - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> <li>Space and water heating</li> <li>Pumps and fans</li> <li>Electricity for lighting</li> <li>Total CO<sub>2</sub>, kg/year</li> <li>Dwelling CO<sub>2</sub> emission rate</li> <li>El value</li> <li>El rating (section 14)</li> <li>El band</li> <li>13a. Primary energy - individual heating systems including mic</li> <li>Space heating - main system 1</li> <li>Water heating</li> <li>Space and water heating</li> <li>Pumps and fans</li> <li>Electricity for lighting</li> </ul> | Energy         kWh/year         4553.49         2493.03         75.00         405.85                              | x<br>x<br>x<br>x<br>x<br>x<br>x<br>x      | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52<br>Primary factor<br>1.22<br>(261) + (262) +<br>3.07<br>3.07 | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =<br>=<br>=<br>=<br>(263) + (264) =<br>=<br>=<br>= | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B<br>Primary Energy<br>kWh/year<br>5555.25<br>3041.50<br>8596.76<br>230.25<br>1245.95                      | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>] (274)<br>] (274)<br>] (261)<br>] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268) |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band<br>13a. Primary energy - individual heating systems including mi<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Primary energy kWh/year   | Energy         kWh/year         4553.49         2493.03         75.00         405.85                              | x<br>x<br>x<br>x<br>x<br>x<br>x<br>x<br>x | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52<br>Primary factor<br>1.22<br>(261) + (262) +<br>3.07<br>3.07 | $=$ $=$ $(263) + (264) =$ $=$ $(265)(271) =$ $(272) \div (4) =$ $=$ $=$ $(263) + (264) =$ $=$ $=$                     | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B<br>Primary Energy<br>kWh/year<br>5555.25<br>3041.50<br>8596.76<br>230.25<br>1245.95<br>10072.96          | ) (261)<br>) (264)<br>) (267)<br>] (268)<br>] (272)<br>] (273)<br>] (273)<br>] (274)<br>] (261)<br>] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272) |
| 12a. CO <sub>2</sub> emissions - individual heating systems including mic<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Total CO <sub>2</sub> , kg/year<br>Dwelling CO <sub>2</sub> emission rate<br>El value<br>El rating (section 14)<br>El band<br>13a. Primary energy - individual heating systems including mi<br>Space heating - main system 1<br>Water heating<br>Space and water heating<br>Space and water heating<br>Pumps and fans<br>Electricity for lighting<br>Primary energy kWh/year<br>Dwelling primary energy rate kWh/m2/year                | Energy         kWh/year         4553.49         2493.03         75.00         405.85                              | x<br>x<br>x<br>x<br>x<br>x<br>x<br>x<br>x | Emission factor<br>kg CO <sub>2</sub> /kWh<br>0.22<br>(261) + (262) +<br>0.52<br>0.52<br>0.52<br>Primary factor<br>1.22<br>(261) + (262) +<br>3.07<br>3.07 | =<br>=<br>(263) + (264) =<br>=<br>=<br>(265)(271) =<br>(272) ÷ (4) =<br>=<br>=<br>(263) + (264) =<br>=<br>=           | Emissions<br>kg CO <sub>2</sub> /year<br>983.55<br>538.50<br>1522.05<br>38.93<br>210.64<br>1771.61<br>17.56<br>83.73<br>84<br>B<br>Primary Energy<br>kWh/year<br>5555.25<br>3041.50<br>8596.76<br>230.25<br>1245.95<br>10072.96<br>99.83 | ] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273)<br>] (274)<br>] (261)<br>] (264)<br>] (265)<br>] (267)<br>] (268)<br>] (272)<br>] (273) |

# 14 Appendix D – BRUKL Report (Efficiency)

The following BRUKL Report is taken from the SBEM software for the retail unit in accordance with current London Plan policy – this is following inclusion of the energy efficiency measures, but before inclusion of the air source heat pump and photovoltaic systems proposed.

# **BRUKL Output Document**

Compliance with England Building Regulations Part L 2013

## **Project name**

## **Marine Ices**

### Date: Thu Jan 15 20:25:45 2015

### Administrative information

# Building Details

### **Certification tool**

Calculation engine: SBEM

Calculation engine version: v5.2.d.2

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v4.2.0 BRUKL compliance check version: v5.2.d.2

## **Owner Details**

Name: Telephone number: Address: , ,

**Certifier details** 

Name: John Simpson Telephone number: 01206 266755 Address: , Colchester, CO2 8JX

## Criterion 1: The calculated CO<sub>2</sub> emission rate for the building should not exceed the target

| CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum | 49.8                |
|--|---------------------|
| Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum               | 49.8                |
| Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum             | 46.7                |
| Are emissions from the building less than or equal to the target?                                  | BER =< TER          |
| Are as built details the same as used in the BER calculations?                                     | Separate submission |

# Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

| Element  | Ua-Limit | Ua-Calc | Ui-Calc | Surface where the maximum value occurs* |
|--|----------|---------|---------|---|
| Wall**   | 0.35     | 0.2     | 0.2     | Basement 1 - Screen 2_W_4               |
| Floor  | 0.25     | 0.15    | 0.15    | Basement 1 - Screen 2_S_3               |
| Roof   | 0.25     | 0.15    | 0.15    | Basement 2 - Circulation 1_R_9          |
| Windows***, roof windows, and rooflights             | 2.2      | 1.6     | 1.6     | Grd Floor - Bar_G_11                    |
| Personnel doors                                      | 2.2      | 1.8     | 1.8     | Grd Floor - Circ_D_11                   |
| Vehicle access & similar large doors                 | 1.5      | -       | -       | "No external vehicle access doors"      |
| High usage entrance doors                            | 3.5      | -       | -       | "No external high usage entrance doors" |
| Ua-Limit = Limiting area-weighted average U-values M | //(m²K)] |         |         |   |

Ua-Limit = Limiting area-weighted average U-values [W/(m<sup>-</sup>K)] Ua-Calc = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

Ui-Calc = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

\* There might be more than one surface where the maximum U-value occurs.

\*\* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

\*\*\* Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

| Air Permeability   | Worst acceptable standard | This building |  |  |  |
|--------------------|---------------------------|---------------|--|--|--|
| m³/(h.m²) at 50 Pa | 10                        | 5             |  |  |  |

## As designed

#### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

| Whole building lighting automatic monitoring & targeting with alarms for out-of-range values | YES   |
|--|-------|
| Whole building electric power factor achieved by power factor correction                     | >0.95 |

#### 1- Retail AC System

|                | Heating efficiency   | Cooling efficiency    | Radiant efficiency    | SFP [W/(I/s)] | HR efficiency |  |
|----------------|----------------------|-----------------------|-----------------------|---------------|---------------|--|
| This system    | 0.92                 | 2.8                   | -                     | 1.5           | 0.65          |  |
| Standard value | 0.91*                | N/A                   | N/A                   | 1.6^          | 0.5           |  |
| Automatic moni | toring & targeting w | ith alarms for out-of | -range values for thi | s HVAC syster | n NO          |  |

\* Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems > 2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Allowed SFP may be increased by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

#### 1- Central DHW

|                | Water heating efficiency | Storage loss factor [kWh/litre per day] |
|----------------|--------------------------|---|
| This building  | 1                        | -                                       |
| Standard value | 1                        | N/A                                     |

#### Local mechanical ventilation, exhaust, and terminal units

| ID | System type in Non-domestic Building Services Compliance Guide  |
|----|---|
| Α  | Local supply or extract ventilation units serving a single area   |
| В  | Zonal supply system where the fan is remote from the zone   |
| С  | Zonal extract system where the fan is remote from the zone  |
| D  | Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery |
| Е  | Local supply and extract ventilation system serving a single area with heating and heat recovery        |
| F  | Other local ventilation units   |
| G  | Fan-assisted terminal VAV unit  |
| н  | Fan coil units  |
| I  | Zonal extract system where the fan is remote from the zone with grease filter                           |

| Zone name                  |     |     |     | SF  | P [W/ | (l/s)] |     |     |   | UD officionov |          |
|----------------------------|-----|-----|-----|-----|-------|--------|-----|-----|---|---------------|----------|
| ID of system type          | Α   | В   | С   | D   | E     | F      | G   | н   | I | нк епісіенсу  |          |
| Standard value             | 0.3 | 1.1 | 0.5 | 1.9 | 1.6   | 0.5    | 1.1 | 0.5 | 1 | Zone          | Standard |
| Basement 1 - Screen 2      | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 2 - Screen 1      | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 2 - Circulation 1 | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 2 - Projector 1   | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 2 - Projector     | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 2 - Shower room   | -   | -   | 0.4 | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 2 - WCs 1         | -   | -   | 0.4 | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 2 - WCs           | -   | -   | 0.4 | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 2 - Circulation   | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 3 - Screen 3      | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Basement 3 - Projector     | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Grd Floor - Circ           | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |
| Grd Floor - Projector      | -   | -   | -   | -   | -     | -      | -   | 0.8 | - | -             | N/A      |

| Zone name                 |     | SFP [W/(I/s)] |     |     |     |     |     |     |   |              |          |
|---------------------------|-----|---------------|-----|-----|-----|-----|-----|-----|---|--------------|----------|
| ID of system type         | Α   | В             | С   | D   | E   | F   | G   | Н   | I | пк епісіепсу |          |
| Standard value            | 0.3 | 1.1           | 0.5 | 1.9 | 1.6 | 0.5 | 1.1 | 0.5 | 1 | Zone         | Standard |
| Grd Floor - Kitchen       | -   | -             | -   | -   | -   | -   | -   | 0.8 | - | -            | N/A      |
| Grd Floor - WCs           | -   | -             | 0.4 | -   | -   | -   | -   | 0.8 | - | -            | N/A      |
| Grd Floor - Bar           | -   | -             | -   | -   | -   | -   | -   | 0.8 | - | -            | N/A      |
| Grd Floor - Circ          | -   | -             | -   | -   | -   | -   | -   | 0.8 | - | -            | N/A      |
| Grd Floor - Stores        | -   | -             | -   | -   | -   | -   | -   | 0.8 | - | -            | N/A      |
| Grd Floor - Circ          | -   | -             | -   | -   | -   | -   | -   | 0.8 | - | -            | N/A      |
| Grd Floor - Circ          | -   | -             | -   | -   | -   | -   | -   | 0.8 | - | -            | N/A      |
| Basement 2 - Plant Room 1 | -   | -             | -   | 1.5 | -   | -   | -   | -   | - | 0.65         | 0.5      |
| Basement 2 - Plant Room   | -   | -             | -   | 1.5 | -   | -   | -   | -   | - | 0.65         | 0.5      |
| Basement 3 - Plant Room   | -   | -             | -   | 1.5 | -   | -   | -   | -   | - | 0.65         | 0.5      |

| General lighting and display lighting | Lumino    | ous effic | acy [lm/W]   |                      |
|---------------------------------------|-----------|-----------|--------------|----------------------|
| Zone name                             | Luminaire | Lamp      | Display lamp | General lighting [W] |
| Standard value                        | 60        | 60        | 22           |                      |
| Basement 1 - Screen 2                 | -         | 85        | 65           | 1274                 |
| Basement 2 - Screen 1                 | -         | 85        | 65           | 2018                 |
| Basement 2 - Circulation 1            | -         | 85        | 65           | 3119                 |
| Basement 2 - Projector 1              | 85        | -         | -            | 23                   |
| Basement 2 - Projector                | -         | 85        | 65           | 115                  |
| Basement 2 - Shower room              | -         | 85        | -            | 34                   |
| Basement 2 - WCs 1                    | -         | 85        | -            | 85                   |
| Basement 2 - WCs                      | -         | 85        | -            | 68                   |
| Basement 2 - Circulation              | -         | 85        | 65           | 197                  |
| Basement 3 - Screen 3                 | -         | 85        | 65           | 1754                 |
| Basement 3 - Projector                | -         | 85        | 65           | 221                  |
| Grd Floor - Circ                      | -         | 85        | 65           | 1270                 |
| Grd Floor - Projector                 | -         | 85        | 65           | 143                  |
| Grd Floor - Kitchen                   | -         | 85        | 65           | 412                  |
| Grd Floor - WCs                       | -         | 85        | -            | 98                   |
| Grd Floor - Bar                       | -         | 85        | 65           | 2136                 |
| Grd Floor - Circ                      | -         | 85        | 65           | 151                  |
| Grd Floor - Stores                    | -         | 85        | 65           | 259                  |
| Grd Floor - Circ                      | -         | 85        | 65           | 91                   |
| Grd Floor - Circ                      | -         | 85        | 65           | 540                  |
| Basement 2 - Plant Room 1             | 85        | -         | -            | 117                  |
| Basement 2 - Plant Room               | 85        | -         | -            | 47                   |
| Basement 3 - Plant Room               | 85        | -         | -            | 391                  |

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

| Zone                  | Solar gain limit exceeded? (%) | Internal blinds used? |
|-----------------------|--------------------------------|-----------------------|
| Basement 1 - Screen 2 | N/A                            | N/A                   |
| Basement 2 - Screen 1 | N/A                            | N/A                   |

| Zone                       | Solar gain limit exceeded? (%) | Internal blinds used? |
|----------------------------|--------------------------------|-----------------------|
| Basement 2 - Circulation 1 | N/A                            | N/A                   |
| Basement 2 - Projector     | N/A                            | N/A                   |
| Basement 2 - Circulation   | N/A                            | N/A                   |
| Basement 3 - Screen 3      | N/A                            | N/A                   |
| Basement 3 - Projector     | N/A                            | N/A                   |
| Grd Floor - Circ           | N/A                            | N/A                   |
| Grd Floor - Projector      | N/A                            | N/A                   |
| Grd Floor - Kitchen        | N/A                            | N/A                   |
| Grd Floor - Bar            | NO (-1.2%)                     | NO                    |
| Grd Floor - Circ           | N/A                            | N/A                   |
| Grd Floor - Stores         | N/A                            | N/A                   |
| Grd Floor - Circ           | NO (-7.7%)                     | NO                    |
| Grd Floor - Circ           | N/A                            | N/A                   |

# Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

## EPBD (Recast): Consideration of alternative energy systems

| Were alternative energy systems considered and analysed as part of the design process? | NO |
|--|----|
| Is evidence of such assessment available as a separate submission?                     | NO |
| Are any such measures included in the proposed design?                                 | NO |

## Technical Data Sheet (Actual vs. Notional Building)

## **Building Global Parameters**

|   | Actual | Notional |
|---|--------|----------|
| Area [m <sup>2</sup> ]                                | 1218.5 | 1218.5   |
| External area [m <sup>2</sup> ]                       | 2587.3 | 2587.3   |
| Weather   | LON    | LON      |
| Infiltration [m <sup>3</sup> /hm <sup>2</sup> @ 50Pa] | 5      | 3        |
| Average conductance [W/K]                             | 567.33 | 753.41   |
| Average U-value [W/m <sup>2</sup> K]                  | 0.22   | 0.29     |
| Alpha value* [%]                                      | 14.97  | 10.62    |

\* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

## **Building Use**

1

## % Area Building Type 99 A1/A2 Retail/Financial and

| A1/A2 Retail/Financial and Professional services            |
|---|
| A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways      |
| B1 Offices and Workshop businesses                          |
| B2 to B7 General Industrial and Special Industrial Groups   |
| B8 Storage or Distribution                                  |
| C1 Hotels   |
| C2 Residential Inst.: Hospitals and Care Homes              |
| C2 Residential Inst.: Residential schools                   |
| C2 Residential Inst.: Universities and colleges             |
| C2A Secure Residential Inst.                                |
| Residential spaces  |
| D1 Non-residential Inst.: Community/Day Centre              |
| D1 Non-residential Inst.: Libraries, Museums, and Galleries |
| D1 Non-residential Inst.: Education                         |
| D1 Non-residential Inst.: Primary Health Care Building      |
| D1 Non-residential Inst.: Crown and County Courts           |
| D2 General Assembly and Leisure, Night Clubs and Theatres   |
| Others: Passenger terminals                                 |
|   |

- Others: Emergency services
- Others: Miscellaneous 24hr activities
- Others: Car Parks 24 hrs
- Others Stand alone utility block

## Energy Consumption by End Use [kWh/m<sup>2</sup>]

|            | Actual | Notional |
|------------|--------|----------|
| Heating    | 3.49   | 2.96     |
| Cooling    | 19.84  | 14.56    |
| Auxiliary  | 29.18  | 16.02    |
| Lighting   | 40.32  | 65.43    |
| Hot water  | 1.44   | 1.66     |
| Equipment* | 43.47  | 43.47    |
| TOTAL**    | 94.26  | 100.64   |

\* Energy used by equipment does not count towards the total for calculating emissions. \*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

## Energy Production by Technology [kWh/m<sup>2</sup>]

|                       | Actual | Notional |
|-----------------------|--------|----------|
| Photovoltaic systems  | 0      | 0        |
| Wind turbines         | 0      | 0        |
| CHP generators        | 0      | 0        |
| Solar thermal systems | 0      | 0        |

## Energy & CO<sub>2</sub> Emissions Summary

|   | Actual | Notional |
|---|--------|----------|
| Heating + cooling demand [MJ/m <sup>2</sup> ] | 143.85 | 197.46   |
| Primary energy* [kWh/m <sup>2</sup> ]         | 275.96 | 292.83   |
| Total emissions [kg/m <sup>2</sup> ]          | 46.7   | 49.8     |

\* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

| ŀ   | HVAC Systems Performance  |                   |                   |                    |                    |                   |               |               |                  |                  |
|-----|---|-------------------|-------------------|--------------------|--------------------|-------------------|---------------|---------------|------------------|------------------|
| Sys | stem Type   | Heat dem<br>MJ/m2 | Cool dem<br>MJ/m2 | Heat con<br>kWh/m2 | Cool con<br>kWh/m2 | Aux con<br>kWh/m2 | Heat<br>SSEEF | Cool<br>SSEER | Heat gen<br>SEFF | Cool gen<br>SEER |
| [ST | [ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity |                   |                   |                    |                    |                   |               |               |                  |                  |
|     | Actual  | 10.8              | 148               | 3.9                | 21.9               | 31.9              | 0.78          | 1.88          | 0.92             | 2.5              |
|     | Notional  | 9.6               | 208.4             | 3.3                | 16.1               | 17.6              | 0.82          | 3.6           |                  |                  |
| [ST | [ST] No Heating or Cooling  |                   |                   |                    |                    |                   |               |               |                  |                  |
|     | Actual  | 0                 | 0                 | 0                  | 0                  | 3.2               | 0             | 0             | 0                | 0                |
|     | Notional  | 0                 | 0                 | 0                  | 0                  | 1.2               | 0             | 0             |                  |                  |

## Key to terms

| Heat dem [MJ/m2]  | = Heating energy demand   |
|-------------------|---|
| Cool dem [MJ/m2]  | = Cooling energy demand   |
| Heat con [kWh/m2] | = Heating energy consumption  |
| Cool con [kWh/m2] | = Cooling energy consumption  |
| Aux con [kWh/m2]  | = Auxiliary energy consumption  |
| Heat SSEFF        | = Heating system seasonal efficiency (for notional building, value depends on activity glazing class) |
| Cool SSEER        | = Cooling system seasonal energy efficiency ratio   |
| Heat gen SSEFF    | = Heating generator seasonal efficiency   |
| Cool gen SSEER    | = Cooling generator seasonal energy efficiency ratio  |
| ST                | = System type   |
| HS                | = Heat source   |
| HFT               | = Heating fuel type   |
| CFT               | = Cooling fuel type   |

= Cooling fuel type

Page 6 of 7

## **Key Features**

The BCO can give particular attention to items with specifications that are better than typically expected.

### **Building fabric**

| Element   | <b>U</b> і-Тур | Ui-Min     | Surface where the minimum value occurs*   |  |  |  |
|---|----------------|------------|---|--|--|--|
| Wall  | 0.23           | 0.2        | Basement 1 - Screen 2_W_4   |  |  |  |
| Floor   | 0.2            | 0.15       | Basement 1 - Screen 2_S_3   |  |  |  |
| Roof  | 0.15           | 0.15       | Basement 2 - Circulation 1_R_9  |  |  |  |
| Windows, roof windows, and rooflights                               | 1.5            | 1.6        | Grd Floor - Bar_G_11  |  |  |  |
| Personnel doors   | 1.5            | 1.8        | Grd Floor - Circ_D_11   |  |  |  |
| Vehicle access & similar large doors                                | 1.5            | -          | "No external vehicle access doors"  |  |  |  |
| High usage entrance doors   | 1.5            | -          | "No external high usage entrance doors"   |  |  |  |
| Ui-Typ = Typical individual element U-values [W/(m <sup>2</sup> K)] |                |            | U <sub>I-Min</sub> = Minimum individual element U-values [W/(m <sup>2</sup> K)] |  |  |  |
| * There might be more than one surface where the m                  | ninimum U      | -value occ | curs.   |  |  |  |

| Air Permeability   | Typical value | This building |
|--------------------|---------------|---------------|
| m³/(h.m²) at 50 Pa | 5             | 5             |

# 15 Appendix E – BRUKL Report (ASHPs)

The following BRUKL Report is taken from the SBEM software for the retail unit in accordance with current London Plan policy – this is following inclusion of the proposed air source heat pump system, but without the photovoltaic panels included.

# **BRUKL Output Document**

Compliance with England Building Regulations Part L 2013

### **Project name**

## **Marine Ices**

### Date: Thu Jan 15 19:39:12 2015

### Administrative information

# Building Details

### **Certification tool**

Calculation engine: SBEM

Calculation engine version: v5.2.d.2

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v4.2.0 BRUKL compliance check version: v5.2.d.2

## **Owner Details**

Name: Telephone number: Address: , ,

Certifier details

Name: John Simpson Telephone number: 01206 266755 Address: , Colchester, CO2 8JX

## Criterion 1: The calculated CO<sub>2</sub> emission rate for the building should not exceed the target

| CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum | 43.7                |
|--|---------------------|
| Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum               | 43.7                |
| Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum             | 30.4                |
| Are emissions from the building less than or equal to the target?                                  | BER =< TER          |
| Are as built details the same as used in the BER calculations?                                     | Separate submission |

# Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

| Element  | Ua-Limit | Ua-Calc | Ui-Calc | Surface where the maximum value occurs* |
|--|----------|---------|---------|---|
| Wall**   | 0.35     | 0.2     | 0.2     | Basement 1 - Screen 2_W_4               |
| Floor  | 0.25     | 0.15    | 0.15    | Basement 1 - Screen 2_S_3               |
| Roof   | 0.25     | 0.15    | 0.15    | Basement 2 - Circulation 1_R_9          |
| Windows***, roof windows, and rooflights             | 2.2      | 1.6     | 1.6     | Grd Floor - Bar_G_11                    |
| Personnel doors                                      | 2.2      | 1.8     | 1.8     | Grd Floor - Circ_D_11                   |
| Vehicle access & similar large doors                 | 1.5      | -       | -       | "No external vehicle access doors"      |
| High usage entrance doors                            | 3.5      | -       | -       | "No external high usage entrance doors" |
| Ua-Limit = Limiting area-weighted average U-values M | //(m²K)] |         |         |   |

Ua-Limit = Limiting area-weighted average U-values [W/(m<sup>-</sup>K)] Ua-Calc = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

Ui-Calc = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

\* There might be more than one surface where the maximum U-value occurs.

\*\* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

\*\*\* Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

| Air Permeability   | Worst acceptable standard | This building |
|--------------------|---------------------------|---------------|
| m³/(h.m²) at 50 Pa | 10                        | 5             |

## As designed

#### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

| Whole building lighting automatic monitoring & targeting with alarms for out-of-range values |       |  |  |  |  |
|--|-------|--|--|--|--|
| Whole building electric power factor achieved by power factor correction                     | >0.95 |  |  |  |  |

#### 1- VRF System

|   | Heating efficiency | Cooling efficiency | Radiant efficiency | SFP [W/(I/s)] | HR efficiency |  |  |  |  |
|---|--------------------|--------------------|--------------------|---------------|---------------|--|--|--|--|
| This system   | 4                  | 3.6                | -                  | -             | -             |  |  |  |  |
| Standard value  | 2.5*               | 2.6                | N/A                | N/A           | N/A           |  |  |  |  |
| Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES   |                    |                    |                    |               |               |  |  |  |  |
| * Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 |                    |                    |                    |               |               |  |  |  |  |

for limiting standards.

#### 1- Central DHW

|                | Water heating efficiency | Storage loss factor [kWh/litre per day] |
|----------------|--------------------------|---|
| This building  | 1                        | -                                       |
| Standard value | 1                        | N/A                                     |

#### Local mechanical ventilation, exhaust, and terminal units

| ID | System type in Non-domestic Building Services Compliance Guide  |
|----|---|
| Α  | Local supply or extract ventilation units serving a single area   |
| В  | Zonal supply system where the fan is remote from the zone   |
| С  | Zonal extract system where the fan is remote from the zone  |
| D  | Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery |
| Е  | Local supply and extract ventilation system serving a single area with heating and heat recovery        |
| F  | Other local ventilation units   |
| G  | Fan-assisted terminal VAV unit  |
| Н  | Fan coil units  |
| 1  | Zonal extract system where the fan is remote from the zone with grease filter                           |

|  | Zonal extract system where | the fan is remote from | the zone with grease filter |
|--|----------------------------|------------------------|-----------------------------|
|--|----------------------------|------------------------|-----------------------------|

| Zone name                  | SFP [W/(I/s)] |     |     |     |     |     |     |     |   |      |              |  |
|----------------------------|---------------|-----|-----|-----|-----|-----|-----|-----|---|------|--------------|--|
| ID of system type          | Α             | В   | С   | D   | E   | F   | G   | Н   | I | пке  | пк епісіенсу |  |
| Standard value             | 0.3           | 1.1 | 0.5 | 1.9 | 1.6 | 0.5 | 1.1 | 0.5 | 1 | Zone | Standard     |  |
| Basement 1 - Screen 2      | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Basement 2 - Screen 1      | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Basement 2 - Circulation 1 | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Basement 2 - Projector 1   | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Basement 2 - Projector     | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Basement 2 - Shower room   | -             | -   | 0.4 | -   | -   | -   | -   | -   | - | -    | N/A          |  |
| Basement 2 - WCs 1         | -             | -   | 0.4 | -   | -   | -   | -   | -   | - | -    | N/A          |  |
| Basement 2 - WCs           | -             | -   | 0.4 | -   | -   | -   | -   | -   | - | -    | N/A          |  |
| Basement 2 - Circulation   | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Basement 3 - Screen 3      | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Basement 3 - Projector     | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Grd Floor - Circ           | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Grd Floor - Projector      | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Grd Floor - Kitchen        | -             | -   | -   | 1.5 | -   | -   | -   | -   | - | 0.65 | 0.5          |  |
| Grd Floor - WCs            | -             | -   | 0.4 | -   | -   | -   | -   | -   | - | -    | N/A          |  |

| Zone name                 |     | SFP [W/(I/s)] |     |     |     | UP officiency |     |     |   |      |              |  |  |
|---------------------------|-----|---------------|-----|-----|-----|---------------|-----|-----|---|------|--------------|--|--|
| ID of system type         | Α   | В             | С   | D   | E   | F             | G   | н   | I | пке  | нк епісіепсу |  |  |
| Standard value            | 0.3 | 1.1           | 0.5 | 1.9 | 1.6 | 0.5           | 1.1 | 0.5 | 1 | Zone | Standard     |  |  |
| Grd Floor - Bar           | -   | -             | -   | 1.5 | -   | -             | -   | -   | - | 0.65 | 0.5          |  |  |
| Grd Floor - Circ          | -   | -             | -   | 1.5 | -   | -             | -   | -   | - | 0.65 | 0.5          |  |  |
| Grd Floor - Stores        | -   | -             | -   | 1.5 | -   | -             | -   | -   | - | 0.65 | 0.5          |  |  |
| Grd Floor - Circ          | -   | -             | -   | 1.5 | -   | -             | -   | -   | - | 0.65 | 0.5          |  |  |
| Grd Floor - Circ          | -   | -             | -   | -   | -   | -             | -   | -   | - | -    | N/A          |  |  |
| Basement 2 - Plant Room 1 | -   | -             | -   | 1.5 | -   | -             | -   | -   | - | 0.65 | 0.5          |  |  |
| Basement 2 - Plant Room   | -   | -             | -   | 1.5 | -   | -             | -   | -   | - | 0.65 | 0.5          |  |  |
| Basement 3 - Plant Room   | -   | -             | -   | 1.5 | -   | -             | -   | -   | - | 0.65 | 0.5          |  |  |

| General lighting and display lighting | Luminous efficacy [lm/W] |      |              |                      |
|---------------------------------------|--------------------------|------|--------------|----------------------|
| Zone name                             | Luminaire                | Lamp | Display lamp | General lighting [W] |
| Standard value                        | 60                       | 60   | 22           |                      |
| Basement 1 - Screen 2                 | -                        | 85   | 65           | 1274                 |
| Basement 2 - Screen 1                 | -                        | 85   | 65           | 2018                 |
| Basement 2 - Circulation 1            | -                        | 85   | 65           | 3119                 |
| Basement 2 - Projector 1              | 85                       | -    | -            | 23                   |
| Basement 2 - Projector                | -                        | 85   | 65           | 115                  |
| Basement 2 - Shower room              | -                        | 85   | -            | 34                   |
| Basement 2 - WCs 1                    | -                        | 85   | -            | 85                   |
| Basement 2 - WCs                      | -                        | 85   | -            | 68                   |
| Basement 2 - Circulation              | -                        | 85   | 65           | 197                  |
| Basement 3 - Screen 3                 | -                        | 85   | 65           | 1754                 |
| Basement 3 - Projector                | -                        | 85   | 65           | 221                  |
| Grd Floor - Circ                      | -                        | 85   | 65           | 1270                 |
| Grd Floor - Projector                 | -                        | 85   | 65           | 143                  |
| Grd Floor - Kitchen                   | -                        | 85   | 65           | 412                  |
| Grd Floor - WCs                       | -                        | 85   | -            | 98                   |
| Grd Floor - Bar                       | -                        | 85   | 65           | 2136                 |
| Grd Floor - Circ                      | -                        | 85   | 65           | 151                  |
| Grd Floor - Stores                    | -                        | 85   | 65           | 259                  |
| Grd Floor - Circ                      | -                        | 85   | 65           | 91                   |
| Grd Floor - Circ                      | -                        | 85   | 65           | 540                  |
| Basement 2 - Plant Room 1             | 85                       | -    | -            | 117                  |
| Basement 2 - Plant Room               | 85                       | -    | -            | 47                   |
| Basement 3 - Plant Room               | 85                       | -    | -            | 391                  |

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

| Zone                       | Solar gain limit exceeded? (%) | Internal blinds used? |
|----------------------------|--------------------------------|-----------------------|
| Basement 1 - Screen 2      | N/A                            | N/A                   |
| Basement 2 - Screen 1      | N/A                            | N/A                   |
| Basement 2 - Circulation 1 | N/A                            | N/A                   |
| Basement 2 - Projector     | N/A                            | N/A                   |
| Zone                     | Solar gain limit exceeded? (%) | Internal blinds used? |
|--------------------------|--------------------------------|-----------------------|
| Basement 2 - Circulation | N/A                            | N/A                   |
| Basement 3 - Screen 3    | N/A                            | N/A                   |
| Basement 3 - Projector   | N/A                            | N/A                   |
| Grd Floor - Circ         | N/A                            | N/A                   |
| Grd Floor - Projector    | N/A                            | N/A                   |
| Grd Floor - Kitchen      | N/A                            | N/A                   |
| Grd Floor - Bar          | NO (-1.2%)                     | NO                    |
| Grd Floor - Circ         | N/A                            | N/A                   |
| Grd Floor - Stores       | N/A                            | N/A                   |
| Grd Floor - Circ         | NO (-7.7%)                     | NO                    |
| Grd Floor - Circ         | N/A                            | N/A                   |

# Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

# EPBD (Recast): Consideration of alternative energy systems

| Were alternative energy systems considered and analysed as part of the design process? |    |  |
|--|----|--|
| Is evidence of such assessment available as a separate submission?                     | NO |  |
| Are any such measures included in the proposed design?                                 | NO |  |

# Technical Data Sheet (Actual vs. Notional Building)

# **Building Global Parameters**

|   | Actual | Notional |
|---|--------|----------|
| Area [m <sup>2</sup> ]                                | 1218.5 | 1218.5   |
| External area [m <sup>2</sup> ]                       | 2587.3 | 2587.3   |
| Weather   | LON    | LON      |
| Infiltration [m <sup>3</sup> /hm <sup>2</sup> @ 50Pa] | 5      | 3        |
| Average conductance [W/K]                             | 567.33 | 753.41   |
| Average U-value [W/m <sup>2</sup> K]                  | 0.22   | 0.29     |
| Alpha value* [%]                                      | 14.97  | 10.62    |

\* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

## **Building Use**

1

# % Area Building Type 99 A1/A2 Retail/Financial and Professional services A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

- B1 Offices and Workshop businesses B2 to B7 General Industrial and Special Industrial Groups
- B8 Storage or Distribution
- C1 Hotels C2 Residential Inst.: Hospitals and Care Homes
- C2 Residential Inst.: Residential schools
- C2 Residential Inst.: Vesidential schools C2 Residential Inst.: Universities and colleges
- C2A Secure Residential Inst.

### Residential spaces

- D1 Non-residential Inst.: Community/Day Centre
- D1 Non-residential Inst.: Libraries, Museums, and Galleries
- D1 Non-residential Inst.: Education
- D1 Non-residential Inst.: Primary Health Care Building
- D1 Non-residential Inst.: Crown and County Courts

#### D2 General Assembly and Leisure, Night Clubs and Theatres

- Others: Passenger terminals
- Others: Emergency services
- Others: Miscellaneous 24hr activities
- Others: Car Parks 24 hrs
- Others Stand alone utility block

# Energy Consumption by End Use [kWh/m<sup>2</sup>]

|            | Actual | Notional |
|------------|--------|----------|
| Heating    | 0.95   | 1.45     |
| Cooling    | 10.92  | 14.55    |
| Auxiliary  | 6.48   | 3.84     |
| Lighting   | 40.32  | 65.43    |
| Hot water  | 1.44   | 1.66     |
| Equipment* | 43.47  | 43.47    |
| TOTAL**    | 60.09  | 86.93    |

\* Energy used by equipment does not count towards the total for calculating emissions. \*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

# Energy Production by Technology [kWh/m<sup>2</sup>]

|                       | Actual | Notional |
|-----------------------|--------|----------|
| Photovoltaic systems  | 0      | 0        |
| Wind turbines         | 0      | 0        |
| CHP generators        | 0      | 0        |
| Solar thermal systems | 0      | 0        |

## Energy & CO<sub>2</sub> Emissions Summary

|   | Actual | Notional |
|---|--------|----------|
| Heating + cooling demand [MJ/m <sup>2</sup> ] | 145.54 | 201.29   |
| Primary energy* [kWh/m <sup>2</sup> ]         | 179.88 | 257.06   |
| Total emissions [kg/m <sup>2</sup> ]          | 30.4   | 43.7     |

\* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

| ŀ   | HVAC Systems Performance   |                   |                   |                    |                    |                   |               |               |                  |                  |
|-----|----------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|---------------|---------------|------------------|------------------|
| Sys | stem Type                  | Heat dem<br>MJ/m2 | Cool dem<br>MJ/m2 | Heat con<br>kWh/m2 | Cool con<br>kWh/m2 | Aux con<br>kWh/m2 | Heat<br>SSEEF | Cool<br>SSEER | Heat gen<br>SEFF | Cool gen<br>SEER |
| [ST | ] Split or m               | ulti-split sy     | stem, [HS]        | Heat pump          | (electric): a      | air source, [     | HFT] Electr   | ricity, [CFT] | Electricity      |                  |
|     | Actual                     | 14.8              | 146               | 1                  | 12.1               | 6.8               | 3.92          | 3.36          | 4                | 4.5              |
|     | Notional                   | 14                | 208.3             | 1.6                | 16.1               | 4.1               | 2.43          | 3.6           |                  |                  |
| [ST | [ST] No Heating or Cooling |                   |                   |                    |                    |                   |               |               |                  |                  |
|     | Actual                     | 0                 | 0                 | 0                  | 0                  | 3.2               | 0             | 0             | 0                | 0                |
|     | Notional                   | 0                 | 0                 | 0                  | 0                  | 1.2               | 0             | 0             |                  |                  |

## Key to terms

| Heat dem [MJ/m2]  | = Heating energy demand   |
|-------------------|---|
| Cool dem [MJ/m2]  | = Cooling energy demand   |
| Heat con [kWh/m2] | = Heating energy consumption  |
| Cool con [kWh/m2] | = Cooling energy consumption  |
| Aux con [kWh/m2]  | = Auxiliary energy consumption  |
| Heat SSEFF        | = Heating system seasonal efficiency (for notional building, value depends on activity glazing class) |
| Cool SSEER        | = Cooling system seasonal energy efficiency ratio   |
| Heat gen SSEFF    | = Heating generator seasonal efficiency   |
| Cool gen SSEER    | = Cooling generator seasonal energy efficiency ratio  |
| ST                | = System type   |
| HS                | = Heat source   |
| HFT               | = Heating fuel type   |
| CFT               | = Cooling fuel type   |

= Cooling fuel type

# **Key Features**

The BCO can give particular attention to items with specifications that are better than typically expected.

### **Building fabric**

| Element   | <b>U</b> і-Тур | Ui-Min  | Surface where the minimum value occurs* |  |
|---|----------------|---|---|--|
| Wall  | 0.23           | 0.2   | Basement 1 - Screen 2_W_4               |  |
| Floor   | 0.2            | 0.15  | Basement 1 - Screen 2_S_3               |  |
| Roof  | 0.15           | 0.15  | Basement 2 - Circulation 1_R_9          |  |
| Windows, roof windows, and rooflights   | 1.5            | 1.6   | Grd Floor - Bar_G_11                    |  |
| Personnel doors   | 1.5            | 1.8   | Grd Floor - Circ_D_11                   |  |
| Vehicle access & similar large doors  | 1.5            | -   | "No external vehicle access doors"      |  |
| High usage entrance doors   | 1.5            | -   | "No external high usage entrance doors" |  |
| U <sub>I-Typ</sub> = Typical individual element U-values [W/(m <sup>2</sup> K)] |                | Ui-Min = Minimum individual element U-values [W/(m <sup>2</sup> K)] |   |  |
| * There might be more than one surface where the minimum U-value occurs.        |                |   |   |  |

| Air Permeability   | Typical value | This building |
|--------------------|---------------|---------------|
| m³/(h.m²) at 50 Pa | 5             | 5             |