



Energy Strategy

Charlie Ratchford Resource Centre, Belmont Street, London

Iceni Projects Limited on behalf of Vistry Partnerships Ltd

September 2020

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1. EXECUTIVE SUMMARY

- 1.1 Iceni Projects Ltd was commissioned by Vistry Partnerships Ltd to produce an Energy Strategy for the proposed redevelopment of the land currently occupied by the former Charlie Ratchford Resource Centre on Belmont Street, Chalk Farm, NW1 8HF.
- 1.2 This document details the carbon dioxide (CO₂) emissions reduction measures adopted by the proposed development and gives an overview of the design proposals that will ensure the development operates in an energy efficient manner over the lifespan of the scheme.
- 1.3 The scheme proposes the redevelopment of the site to provide 115 new residential dwellings from the ground to the ninth-floor level, together with associated landscaping and ancillary uses.
- 1.4 The energy strategy for the proposed development has been assessed using the Greater London Authority's (GLA) methodology set out in the London Plan and associated documents. This approach is consistent with that required by the London Borough of Camden Local Plan Policy CC1, and therefore represents best practice in meeting the required standards of energy efficiency and carbon dioxide (CO₂) emissions reduction.
- 1.5 The proposed energy strategy is based upon the principles of the Energy Hierarchy on the basis that it is preferable to reduce carbon dioxide emissions through reduced energy consumption above decarbonisation through alternative energy sources.
- 1.6 The key measures proposed to minimise carbon dioxide emissions of the proposed development are set out below.
- 1.7 The proposed 'Be Lean' measures include:
 - High levels of building fabric insulation to minimise heat loss
 - A balanced proportion of façade glazing to ensure natural daylight provision without increasing overheating risk
 - High levels of air tightness to reduce heat loss through infiltration
 - The use of accredited construction details to minimise heat loss through thermal bridging
 - Low energy LED lighting to minimise artificial lighting energy consumption
 - Mechanical ventilation with heat recovery to provide fresh air, with heat recovered from extract air

- A high specification of heating controls to ensure operational efficiency
- 1.8 The 'Be Green' measures include:
 - Employment of a highly efficient, communal air source heat pump system
 - 202 roof-top solar photovoltaic panels to provide renewable energy
- 1.9 Incorporation of the measures outlined above will deliver savings of 79.4 tCO₂ per year for the proposed dwellings, which equates to a 71% improvement over the Part L 2013 baseline using the SAP10 carbon dioxide emissions factors. The level of emissions reduction achieved for each stage of the Energy Hierarchy is shown below.

120

100

80

60

100

be lean be clean be green further on-site savings and/or

off-set payment

carbon savings

Figure 1.1 Carbon dioxide emissions savings after each stage of the Energy Hierarchy

Table 1.1 Carbon dioxide emissions after each stage of the Energy Hierarchy

domestic carbon emissions

	Carbon dioxide emissions for domestic buildings				
	(Tonnes CO₂ per annum)				
	Regulated Unregulated				
Baseline: Part L 2013 of the	112.2	114.4			
Building Regulations					
Compliant Development					
After energy demand	94.5	114.4			
reduction					
After renewable energy	32.7	114.4			

Part L 2013 Target Emission Rate — minimum 35% saving on site

Table 1.2 Regulated carbon dioxide savings from each stage of the Energy Hierarchy

	Regulated domestic carbon dioxide savings			
	(Tonnes CO₂ per annum)	(%)		
Savings from energy demand reduction	17.7	16%		
Savings from renewable energy	61.7	55%		
Cumulative on-site savings	79.4	71%		
Annual savings from offset payment	32.7			
	(Tonne	es CO ₂)		
Cumulative savings for offset payment	982			
Cash in-lieu contribution	£93 _.	,324		

- 1.10 The above analysis shows that the proposed development at Belmont Street, Chalk Farm is able to achieve an on-site saving of 71% in carbon dioxide emissions through the combination of measures set out above.
- 1.11 Overall, the proposals are therefore in accordance with national, local and regional policy requirements, and will provide a development that seeks to promote these principles in operation.

2. INTRODUCTION

2.1 Iceni Projects Ltd was commissioned by Vistry Partnerships Ltd to produce an Energy Strategy for the proposed redevelopment of the land currently occupied by the former Charlie Ratchford Resource Centre on Belmont Street, Chalk Farm, NW1 8HF.

Report Objective

- 2.2 This document details the carbon dioxide (CO₂) emissions reduction measures adopted by the proposed development and gives an overview of the design proposals that will ensure the development operates in an energy efficient manner over the lifespan of the scheme. The Energy Strategy report headlines will provide a framework for the project team to operate consistently within sustainability guidelines set out by the Greater London Authority and the London Borough of Camden.
- 2.3 The report is structured to meet these guidelines as follows:
 - Section 3 discusses the planning context and policies which are relevant to energy;
 - Section 4 discusses the development response to the policy drivers for energy; and
 - Section 5 summarises the development's design response.

Site and Surroundings

- 2.4 The application site (Appendix A1) is situated between Belmont Street and Crogsland Road, approximately 0.2 miles north east of Chalk Farm Underground Station.
- 2.5 The site is bound by Belmont Street to the east, and Crogsland Road to the west. Adjacent to the north is the Denton Estate, a residential development comprised of 19 four-storey apartment blocks, whilst the area to the south is characterised by a mix of commercial, retail and hotel uses. Residential buildings border the site to the east, with the plot adjacent to the proposed development site currently under development. Beyond this plot is Bryant Court, an assisted living facility for the elderly.
- 2.6 The site is currently occupied by the former Charlie Ratchford Resource Centre, which is a purpose-built single storey building the stands within a landscaped area between Belmont Street and Crogsland Road. The main entrance is on Belmont Street, which can also be accessed on foot via a footpath from Crogsland Road.

The Proposed Development

- 2.7 The scheme proposes the redevelopment of the site to provide a total of 115 residential dwellings from the ground to the ninth-floor level.
- 2.8 The scheme comprises of the following mix of residential dwellings:

Table 2.1 Residential dwelling mix

Dwelling Type	Number
1B1P	37
1B2P	39
2B3P	14
2B4P	22
3B5P	1
3B6P	2
Total	115

2.9 The images below show elevations of the scheme, based on the information provided by HTA Architects in August 2020.

Figure 2.1 North elevation (Blocks B and C)



Figure 2.2 North east elevation (Block B)



Figure 2.3 East elevation (Block A)



Figure 2.4 West elevation (Block C)



Figure 2.5 South elevation (Block A and C)

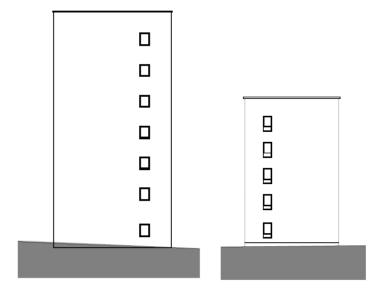


Figure 2.6 East elevation (Block C)

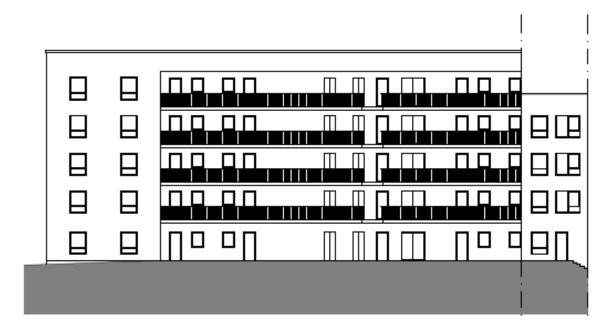


Figure 2.7 South west elevation (Block B)



Figure 2.8 West elevation (Block A)



3. PLANNING AND REGULATORY CONTEXT

3.1 Built environment energy efficiency and carbon dioxide emissions are incorporated within policy and regulation at a national, regional and local level, as set out below.

National

Climate Change Act 2008

- 3.2 On 26th November 2008, the UK Government published the Climate Change Act 2008; the world's first long-term legally binding framework to mitigate against climate change. Within this framework, the Act sets legally binding targets to increase greenhouse gas emission reductions through action in the UK and abroad from the 60% target set out in the Energy White Paper, to 80% by 2050.
- 3.3 As required under Section 34 of the Climate Change Act, the Fifth Annual Carbon Budget was accepted by the Government in June 2016. This sets out a budget for UK emissions for the period 2028 – 2032.
- Climate Change Act 2008
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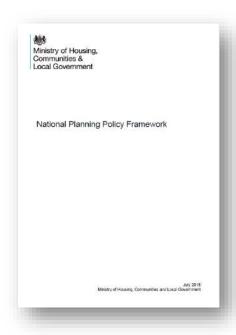
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- 3.4 Following a commitment in June 2019, the Climate Change Act has been amended to target net zero carbon emissions by 2050.

National Planning Policy Framework

- 3.5 The Ministry of Housing, Communities & Local Government determines national policies on different aspects of planning and the rules that govern the operation of the system. Accordingly, the National Planning Policy Framework (NPPF), which came into force in March 2012 and was updated in February 2019, aims to strengthen local decision making.
- 3.6 Paragraphs 10 and 11 of the NPPF confirm that at the heart of this document is a "presumption in favour of sustainable development", and that development proposals that accord with an up-to-date development plan should be approved without delay.



Building Regulations Part L

- 3.7 Part L of the Building Regulations relates to the conservation of fuel and power, and applies to both new and existing buildings. The current edition covers the energy efficiency requirements of the building regulations as set out in Part L of Schedule 1 to the Building Regulations. Technical guidance is contained in 4 Part L Approved Documents and 2 building services compliance guides.
- 3.8 The documents of relevance to this scheme include:
 - the methodology for new build, domestic buildings to meet current energy efficiency standards, including backstop U-values, carbon dioxide emissions calculations and minimising the risk of overheating. Carbon dioxide emissions reductions are prescribed for 'regulated' emissions only, and relate to heating, hot water, lighting, auxiliary and cooling (where specified). Emissions from domestic appliances (cooking, for example) are considered to be unregulated emissions, and are excluded from the analysis.



Domestic Building Services Compliance
 Guide. This provides minimum building services
 efficiencies for domestic buildings.



Regional

3.9 Within Greater London, key sustainable development principles for economic, environmental and social improvement are set out below:

The London Plan (March 2016)

- 3.10 The London Plan is the overall strategic plan for London and includes policies for sustainable development and energy within Chapter 5 (London's response to climate change). Key policies of relevance to this scheme are as follows:
 - Policy 5.2 Minimising Carbon Dioxide This Emissions. states that development proposals should make the fullest contribution to dioxide emissions minimising carbon accordance with the following energy hierarchy:

1. Be lean: use less energy

2. Be clean: supply energy efficiently

3. Be green: use renewable energy

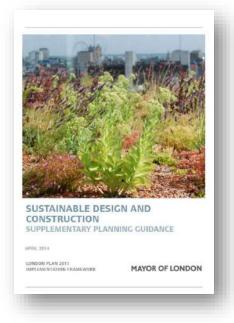


- Policy 5.3 Sustainable Design and Construction. This states that development proposals
 should demonstrate that sustainable design standards are integral to the proposal, including its
 construction and operation, and ensure that they are considered at the beginning of the design
 process.
- Policy 5.6 Decentralised Energy in Development Proposals. This states that major development proposals should select energy systems in accordance with the following hierarchy:
 - 1. Connection to existing heating or cooling networks;
 - 2. Site-wide CHP network;
 - 3. Communal heating and cooling;
- Policy 5.7 Renewable Energy. This states that major development proposals should provide a
 reduction in expected carbon dioxide emissions through the use of on-site renewable energy
 generation, where feasible.

- Policy 5.9 Overheating and Cooling. This states that major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:
 - 1. Minimise internal heat generation through energy efficient design
 - 2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
 - 3. Manage the heat within the building through exposed internal thermal mass and high ceilings
 - 4. Passive ventilation
 - Mechanical ventilation
 - 6. Active cooling systems (ensuring they are the lowest carbon options).

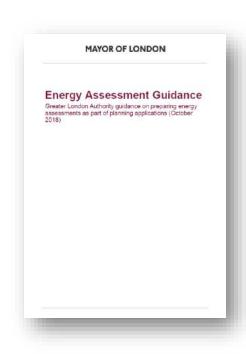
Sustainable Design and Construction Supplementary Planning Guidance (SPG) (April 2014)

3.11 This document provides guidance on the implementation of London Plan policy 5.3 'Sustainable Design and Construction' as well as a range of policies relating to environmental sustainability. The document contains best practice and priority targets for a wide range of issues related to sustainable design and construction, grouped into three categories: resource management, adapting to climate change and greening the city, and pollution management.



Energy Planning – GLA guidance on preparing energy assessments (October 2018)

- 3.12 The guidance note provides further detail on addressing the London Plan's energy hierarchy through the provision of an energy assessment to accompany planning applications. The document sets out the expected carbon dioxide emissions targets for the following building types:
 - New build residential buildings are expected to meet a zero-carbon target. This is made up of a minimum 35% reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site. The remaining regulated carbon dioxide emissions, to 100%, are to be offset through a cash in lieu contribution to the relevant borough to



be ring fenced to secure delivery of carbon dioxide savings elsewhere.

3.13 The latest "Energy Assessment Guidance" (October 2018) states that from January 2019 "planning applicants are encouraged to use the SAP 10 emission factors for referable applications when estimating CO₂ emission performance against London Plan policies".

Local

3.14 In determining the local context, the London Borough of Camden policy is gained through the Camden Local Plan, adopted in July 2017.

Camden Local Plan (adopted July 2017)

- 3.15 The Camden Local Plan is the key strategic document in Camden's development plan. It sets out the vision for shaping the future of the Borough and contains policies for guiding planning decisions. Policies of relevance to this project in the context of sustainability and energy are as follows:
 - Policy CC1 (Climate change mitigation) states that the Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation. The Council will:



- Promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
- Require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
- Ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
- Support and encourage sensitive energy efficiency improvements to existing buildings;
- Require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
- Expect all developments to optimise resource efficiency.

The Council will promote decentralised energy by:

- Working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
- Protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes: and
- Requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

- Policy CC2 (Adapting to Climate Change) states that the Council will promote and measure sustainable design and construction by:
 - Ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation; and
 - Encouraging new build residential development to use the Home Quality Mark and Passivhaus design standards.

Camden Planning Guidance: Energy Efficiency and Adaptation (March 2019)

3.16 This document supports the policies outlines in the Camden Local Plan 2017. This planning guidance document provides information on key energy and resource issues within Camden, and supports Local Plan Policies CC1 (Climate change mitigation) and CC2 (Adapting to climate change).

Borough Wide Heat Demand and Heat Source Mapping: London Borough of Camden (May 2015)

3.17 The Borough Wide Heat Demand and Heat Source Mapping assessment was undertaken for the London Borough of Camden by Buro Happold Engineering in 2015. The purpose of this assessment was to provide an update to the Camden Large Scale CHP Pilot Site identification study undertaken in 2007. It provides an update on the Borough-wide heat demand map, determines the potential for locations to act as secondary heat supply sources, and identifies key opportunity areas for the establishment of decentralised energy networks. Furthermore, a number of building typologies with significant heat demands have been identified. These anchor loads have then been used to inform locations for new decentralised energy networks.

Declaration of a Climate Emergency (April 2019)

3.18 In April 2019, Camden Council declared a Climate Emergency, alongside a commitment to achieve a target of net zero emissions by 2030. In July 2019, Camden held the UK's first Citizens' Assembly on the climate crisis. The Assembly proposals will inform a new Climate Action Plan for Camden, which will be published in 2020.

Other Considerations

The Draft London Plan (December 2017 and updated December 2019)

- 3.19 Although not formally adopted, the GLA will start to give weight to the draft New London Plan immediately following publication, and increased weight will be applied as the draft progresses through the adoption process. Key policies of relevance to this scheme are as follows:
 - Policy SI2 Minimising Greenhouse Gas Emissions. This policy extends the zero-carbon requirement to new non-domestic buildings. The policy adds a fourth layer to the energy hierarchy which requires development to monitor, verify and report on energy performance in operation. In addition, development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-



Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Policy SI3 Energy Infrastructure. This policy recognises that combined heat and power
installations can have negative effects on London's air quality and shifts the focus of
decentralised energy networks to the use of waste or secondary heat sources, where available.
 The policy also recognises that, compared to increasingly decarbonised electricity generation,

gas-fired heat will become comparatively more carbon intensive as the electricity grid is further decarbonised.

Policy SI4 Managing Heat Risk. This policy sets out the standards that should be used to
assess and mitigate overheating risk in new developments. CIBSE TM59 should be used for
domestic developments and CIBSE TM52 should be used for non-domestic developments. In
addition, CIBSE TM49 guidance and datasets should also be used to ensure that all new
development is designed for the climate it will experience over its design life.

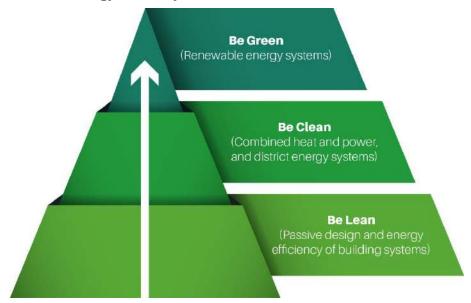
4. ENERGY ASSESSMENT

- 4.1 The energy strategy for the proposed development has been assessed using the Greater London Authority's (GLA) methodology set out in the London Plan and associated documents. This approach is consistent with that required by the London Borough of Camden, and therefore represents best practice in meeting the required standards of energy efficiency and carbon dioxide (CO₂) emissions reduction.
- 4.2 In line with the GLA London Plan Policy 5.2, the scheme will aim to achieve a minimum 35% carbon dioxide emissions reduction through onsite means. In addition, the residual emissions will be offset to zero via cash in-lieu payment to the London Borough of Camden. As specified by the London Borough of Camden, the carbon offset price of £95 per tonne over 30 years will be employed.

Energy Strategy

- 4.3 With reference to the policy requirements, guidance and industry best practice detailed in Section 3, a comprehensive energy and carbon dioxide (CO₂) emissions assessment has been carried out for the proposed development. The energy performance of the scheme has been analysed and evaluated to target a high level of CO₂ emissions performance when assessed against Part L 2013 of the Building Regulations and associated policies, accounting for economic, technical and functional feasibility.
- 4.4 The proposed energy strategy is based upon the principles of the Energy Hierarchy on the basis that it is preferable to reduce carbon dioxide emissions through reduced energy consumption above decarbonisation through alternative energy sources.
- 4.5 The tiers of the Energy Hierarchy are:
 - Be Lean Use less energy
 - Be Clean Supply energy efficiently
 - Be Green Use renewable energy

Figure 4.1 The Energy Hierarchy



'Be Lean' (Use Less Energy)

4.6 Within the first stage of the energy hierarchy, it is proposed to incorporate high levels of passive and energy efficient design measures in order to reduce the development's energy consumption and associated CO₂ emissions.



- 4.7 It is technically possible to exceed Building Regulations requirements (Part L 2013) through demand reduction measures alone and it is an expectation that all applications referred to the Mayor will achieve this.
- 4.8 The proposed development includes a wide range of energy efficiency measures, intended to reduce energy demand.
- 4.9 The massing and orientation of the individual dwellings are constrained by the overall masterplan in terms of delivering the required density, preventing overlooking and ensuring daylight and sunlight provision. Despite this, passive design of the apartments includes a number of specific energy efficiency features.
- 4.10 The following U-values are proposed as a means of limiting heat loss through the apartment building fabric.

Table 4.1 Proposed building fabric U-values

Building Fabric Element	Part L1A:2013 backstop U-values (W/m²K)	Proposed U-values (W/m²K)
Ground floor	0.25	0.10
External wall	0.30	0.15
Roof (with terrace above)	0.20	0.10
Windows	2.00 (including frame)	1.30 (including frame)

- 4.11 The glazing will be double glazed, argon filled with a low emissivity, solar control coating. Although this has yet to be formally specified, it is expected that window U-values will be 1.3 W/m²K or better (including frame), with a g-value of 0.53 and light transmission of ~75% to improve natural daylight penetration.
- 4.12 A high level of air tightness is proposed, where a level equal to or below 3m³/h/m² shall be targeted, meaning that air infiltration between the internal and the external environment will be largely controlled, and space heating/cooling demand further reduced.
- 4.13 The other significant means of heat loss from dwellings is due to thermal (or cold) bridging. This is typically a construction detail which has higher thermal conductivity than the surrounding materials, creating a path of least resistance for heat transfer. Thermal bridges result in an overall reduction in thermal resistance of the building elements and should be designed out where possible to minimise unwanted heat loss. In order to minimise heat loss through thermal bridges, accredited construction details have been assumed, with an equivalent y-value of 0.05 for each dwelling.
- 4.14 High efficiency plant, equipment and controls are proposed to limit the energy consumed in order to provide the required level of indoor environmental performance and control. Performance efficiency values were tested and improved in energy models to benchmark the resulting predicted CO₂ reduction.
 - Low energy LED lighting will be installed throughout the residential apartments.
 - In order to meet the requirements of the GLA's Energy Planning Guidance document under the 'Be Lean' scenario, space and water heating demand within the residential units is served by a communal gas-fired boiler system, with an efficiency of 90%.

- Although residential units are provided with opening windows to mitigate against overheating
 outside air will be provided via mechanical ventilation with heat recover (MVHR), with a specific
 fan power of 0.61 W/l/s. A heat exchanger with an efficiency of 86% has also been specified.
 These efficiencies are higher than those set out in the Domestic Building Services Compliance
 Guide.
- Energy usage for each apartment will be separately metered to ensure that charging for energy is linked to usage.
- Heating will be controlled via the suitable arrangement of plumbing and electrical services.
- 4.15 Energy modelling of the proposed scheme has been undertaken using the Standard Assessment Procedure (SAP) for nine of the proposed units, assessing ground, mid- and top floor apartments for each dwelling type. These are shown in the images below, with further details given in Table 4.2.

Figure 4.2 Sample dwellings modelled





Table 4.2 Sample dwellings modelled

Dwelling	Dwelling Type	Floor	Aspect	Orientation
Reference				
C84	3B5P	0	Dual	North / West
A08	1B1P	1	Single	East
B44	2B3PW	1	Dual	North East / East
C85	2B4P	1	Triple	East / South / West
A25	1B2P	4	Triple	East / South / West
B57	2B3PW	4	Triple	North / North East / West
C114	1B1P	4	Single	West
B76	2B4P	9	Triple	North East / East / South
B79	1B2P	9	Triple	South / South West / West

4.16 Carbon dioxide emissions results from the apartments detailed above have been extrapolated to match the total number of dwellings proposed, as detailed in Table 4.3 below.

Table 4.3 Dwelling mix

Dwelling Type	Number
1B1P	37
1B2P	39
2B3P	14
2B4P	22
3B5P	1
3B6P	2
Total	115

4.17 As outlined in Section 3, the October 2018 update to the GLA Guidance on Energy Assessments encourages the use of SAP 10 carbon emission factors from January 2019 onward. This is due to the significant progress in decarbonising the UK electricity grid since the previous update of Part L in April 2014. The SAP 10 carbon emission factors, which are used within this Energy Assessment, are as follows:

Natural Gas: 0.210 kgCO₂/kWh

Electricity: 0.233 kg/CO₂/kWh

4.18 Based on the energy analysis of the above dwellings, the total energy demand is shown below.

Table 4.4 Energy demand

Energy demand following energy efficiency measures (kWh/year)					
Space heating	Hot water	Lighting	Auxiliary	Cooling	Unregulated loads
145,391	249,552	29,095	20,381	0	540,846

4.19 The total Part L Fabric Energy Efficiency Standard (FEES) for the development is shown below.

Table 4.5 FEES results

	Target Fabric Energy Efficiency (kWh/year)	Design Fabric Energy Efficiency (kWh/year)	Improvement (%)
Development total	51.78	42.17	19%

4.20 The carbon dioxide emissions for the residential component, under the 'Be Lean' tier of the Energy Hierarchy, and using the SAP 10 carbon emission factors, are shown below. DER and TER worksheets showing the 'Be Lean' performance of each of the sample dwellings modelled are provided in Appendix A2.

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Figure 4.3 Carbon dioxide emissions (Be Lean)

Table 4.6 Carbon dioxide emissions (Be Lean)

TER: Baseline: Part L 2013 Emissions (Tonnes CO ₂ per annum)	DER: Proposed 'Be Lean' Emissions (Tonnes CO ₂ per annum)	Emissions Savings (Tonnes CO ₂ per annum)	Emissions Savings (%)
112.2	94.5	17.7	16%

4.21 The above analysis shows that the domestic element of the proposed development achieves a carbon dioxide emissions saving of 16% through energy efficiency measures alone, under the 'Be Lean' scenario.

'Be Clean' (Supply Energy Efficiently)

4.22 The potential for the proposed development to incorporate a low carbon heating/cooling system has been reviewed for the scheme, in line with the hierarchy presented in London Plan policy 5.6, copied below.



- 1. Connection to existing heating or cooling networks;
- 2. Site wide combined heat and power (CHP) network; and
- 3. Communal heating and cooling;
- 4.23 The London Heat Map is a tool provided by the Mayor of London to identify opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study.
- 4.24 The image below is an extract from the London Heat Map, showing the area in the vicinity of the site. It illustrates;
 - Heat demand (areas of heat demand are shown in red, with areas with a high density of heat demand appearing more opaque and areas of zero heat demand appearing transparent);
 - Existing heat networks (shown as red lines);
 - Proposed heat networks (shown as orange lines);
 - Proposed heat networks (GLA PB Power 2005 study; shown as purple lines);
 - Heatmap study areas (shown as transparent white circles); and
 - Potential heat supply sites (shown as red dots).

Figure 4.5 Extract from the London heat map



- 4.25 The extract above indicates that the proposed development site is located within an area of low heat density. Whilst the proposed site is shown to fall within a Heat Network Priority Area, and despite having been identified as a potential heat supply site within the Borough Wide Heat Demand and Heat Source Mapping: London Borough of Camden report prepared by Buro Happold in May 2015, Figure 4.5 above indicates that there are neither any existing nor planned heat networks within proximity to the proposed development site. Based on this, the opportunity for the proposed development to connect to a local heat network at this time is limited.
- 4.26 Furthermore, following correspondence with LBC's Senior Sustainability Officer (Appendix A3), it has been confirmed that there are no detailed plans for a proposed Kentish Town Network at present. It has been highlighted, however, that this area is of interest with regards to the provision of a district heat network, particularly when considering the density of Camden housing to the north of the proposed development site. It has therefore been advised that, in order to ensure the proposed development is future-proofed, measures to facilitate connection to a district heat network in the future should be considered. Measures to facilitate connection to a wider district heat network will therefore be provided as part of the mechanical services design.
- 4.27 The use of CHP is also considered to be unviable for the proposed site, based on the most up-to-date GLA energy guidance, which looks to move away from the use of natural gas to meet space and water heating demands. It is therefore recommended that a communal air source heat pump (ASHP) system is employed to service the development. The incorporation of heat pump technology is discussed in greater detail in the 'Be Green' section.

'Be Green' (Utilise Renewable Technologies)

4.28 A full review of potentially applicable renewable technologies has been carried out, considering both the effectiveness and viability of the different technologies. Full details of the assessment and outcomes are provided in Appendix A4.



- 4.29 Given the site location, lack of local existing or proposed heat networks, and the GLA's requirement to use the draft SAP 10 carbon factors, it is proposed that air source heat pump (ASHP) technology is employed to serve the heating and hot water demands of the residential elements.
- 4.30 It is intended that a highly efficient, communal air source heat pump (ASHP) system will be employed to serve both the space and water heating demand. Typical manufacturer specifications for the proposed system quote a heating and hot water coefficient of performance of 3.19 at a supply temperature of 55degC.. Whilst the specified system operates quietly, as the design progresses, acoustic measures to further limit the noise generated by the outside unit of the system during operation will be considered.

- 4.31 More details on the proposed system are provided in Appendix A4. The ASHP is an approved product on the Microgeneration Certification Scheme and qualifies for the enhanced capital allowances Energy Technology List.
- 4.32 Detailed pipework design is currently being developed and as such it has not yet been possible to calculate precise details of heat losses from pipework. As a worst-case scenario, a 25% loss factor has been applied when undertaking the carbon dioxide emissions calculations for the 'Be Green' stage.
- 4.33 Plant space has been allocated at the ground-floor level, as shown in Figure 4.6 as well as at the roof-level of Block B, as shown in Figure 4.7.



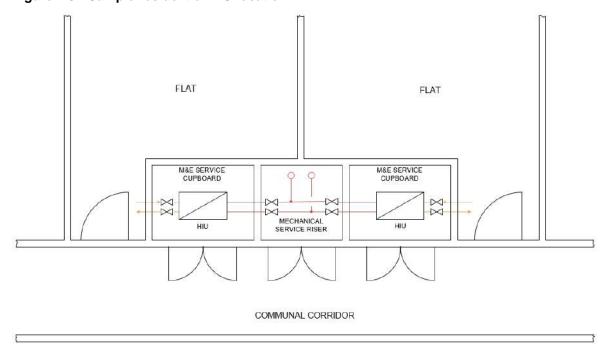
Figure 4.6 Proposed ground-level plant space allocation

Figure 4.7 Proposed roof-level plant space allocation



4.34 Heat will be supplied to individual units via heating interface units (HIUs). In order to facilitate ease of monitoring of site-wide energy usage, a site-wide hard wired heat metering network will connect all units back to the plant rooms.

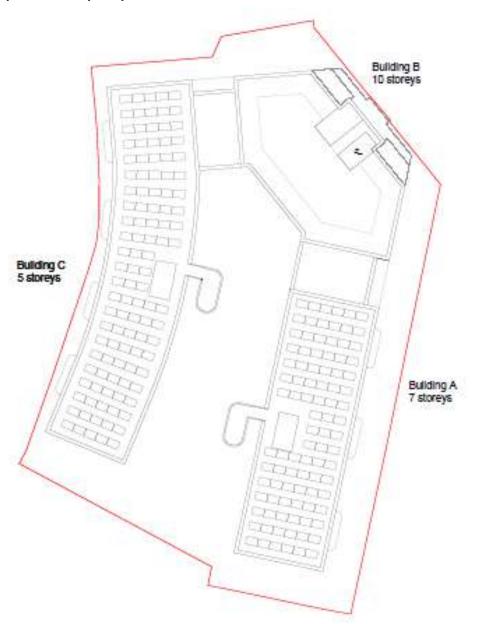
Figure 4.8 Sample residential HIU location



4.35 It is also proposed that an array of photovoltaic (PV) panels be employed to provide carbon-free electricity to the development. The locations of the proposed arrays are highlighted on the roof plan displayed below, based on the drawings produced by HTA Architects. It should be noted that this

plan is indicative at this stage, and demonstrates the proposed location of the PV arrays. These areas, on the flat roofs of Blocks A and C, have been selected to be free from overshading from neighbouring buildings, and rooftop lift overruns. The location of the proposed arrays also takes into account the space required to house the plant associated with the proposed communal ASHP system, which is to be located on the flat roof of Block B.





4.36 The areas proposed for the PV arrays, as indicated on the above plan, have been maximised based on the available roof space when taking the requirements for plant space into account. Based on the configuration set out above, is proposed that the highlighted roof area will house 202 PV panels. The PV coverage extends to all reasonably available roof space that is unshaded and not used by building plant. Standard PV panels have been assumed with an efficiency of ~15% and a dimension of 0.9 x

- 1.6m, providing approximately 250 W per panel (peak output). Panels will be oriented at 15° to the horizontal and face due south to maximise output per panel.
- 4.37 It is estimated that the 202 PV panels will produce an average of 42,925 kWh of renewable electricity per year, equating to a carbon dioxide saving of 10.0 tonnes of CO₂ per year using the SAP 10 electricity emissions factor of 0.233 kgCO₂/kWh.
- 4.38 The domestic 'Be Green' energy analysis was carried out on the same dwellings as indicated in Figure 4.2, above.
- 4.39 The carbon dioxide emissions for the residential component, under the 'Be Green' tier of the Energy Hierarchy is shown below. DER and TER worksheets showing the 'Be Green' performance of each of the dwellings modelled are provided in Appendix A2.

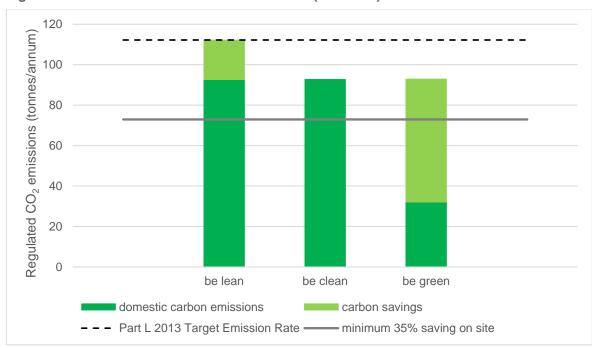


Figure 4.7 Domestic carbon dioxide emissions (Be Green)

Table 4.7 Domestic carbon dioxide emissions (Be Green)

TER: Baseline: Part L	DER: Proposed 'Be	Cumulative	Cumulative
2013 Emissions (Tonnes	Emissions (Tonnes Green' Emissions		Emissions
CO₂ per annum)	(Tonnes CO₂ per annum)	Savings (Tonnes CO₂ per annum)	Savings (%)
112.2	32.7	79.4	71%

4.40 The above analysis shows that the domestic element of the proposed development achieves a carbon dioxide emissions saving of 71% through energy efficiency measures and renewable technologies, under the 'Be Green' scenario.

Carbon Offsetting

- 4.41 As per the requirements of London Plan policy 5.2, new build residential buildings are expected to meet a zero-carbon target. Where the residential component of a development is unable to meet the zero-carbon target through on-site means alone, the remaining regulated carbon dioxide emissions, to 100%, are to be offset through a cash in lieu contribution to local authorities to be ringfenced to secure delivery of carbon dioxide savings elsewhere.
- 4.42 Based on the information presented in Table 4.7 above, a total of 982 tonnes of residual carbon dioxide are required to be offset from the proposed development over a period of 30 years. The established LBC price for carbon dioxide of £95 per tonne has been applied over a 30-year period to calculate the offsetting cost. The 982 tonnes therefore result in an offset cost of £93,324.

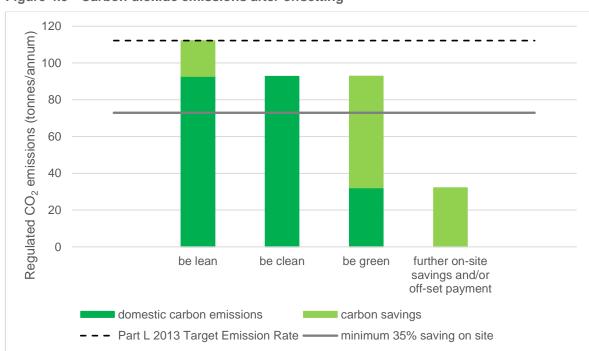


Figure 4.9 Carbon dioxide emissions after offsetting

Cooling and Overheating

4.43 The design of the dwellings has been developed in line with the GLA's recommended 'Cooling Hierarchy' approach, detailed in London Plan policy 5.9. This applies a similar principle to the thorough decision-making process of the Energy Hierarchy, with the aim of reducing CO₂ emissions from cooling and minimising the risk of overheating where no cooling is present:

Minimisation of internal heat generation through energy efficient design

- Heat gain from lighting is kept to a minimum as a result of an energy-efficient lighting design solution.
- The availability of natural light is maximised by optimising the light transmittance of the glass elements of the façade.
- Heat distribution pipework in communal areas of the residential component will be designed to minimise heat loss.
- HIUs will be positioned in apartments adjacent to corridors and risers to minimise pipework runs within apartments.
- The scheme will use a communal air source heat pump, which is a low temperature distribution system, leading to lower internal heat gains from distribution pipework.

Reduction of the amount of heat entering the building in summer

- The building's façades have a limited amount of glazing to mitigate direct solar heat gain while optimising daylight penetration.
- Façade glazing will use solar control glass to reduce solar gains entering dwellings
- The use of inset balconies and blinds will provide solar shading to apartments, although the overheating mitigation strategy is not dependent on the use of blinds.

Management of the heat within the building through exposed thermal mass and high ceilings

• The proposed green roofs will have a high degree of in-built thermal mass to mitigate heat gain and heat loss.

Passive ventilation

- Openable windows on multiple aspect apartments will provide a passive ventilation strategy
 that utilises crossflow ventilation to maximise the potential for natural ventilation within the
 scheme.
- Single aspect dwellings will also have multiple openable windows throughout the façade to provide passive ventilation.

Mechanical and active cooling

- Cooling is not proposed.
- 4.44 The following table reports responses to Section 1 of the GLA's overheating checklist, intended to provide guidance on determining potential residential overheating risk.

Table 4.8 Site features affecting vulnerability to overheating

Section 1 – Site features affect	cting vulnerability to overheating	Yes or No
Site location	Urban – within central London or in a high-density conurbation	Yes
	Peri-urban – on the suburban fringes of London	No
Air quality and/or Noise sensitivity – are any of the	Busy roads / A roads	No
following in the vicinity of the buildings?	Railways / Overground / DLR	No
	Airport / Flight path	No
	Industrial uses / Waste facility	No
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	Potentially
	Are residents likely to be at home during the day?	Potentially
Dwelling aspect	Are there any single aspect units?	Yes
Glazing ratio	Is the glazing ratio (glazing: internal floor area)	Typically
	greater than 25%?	20-30%
	If yes, is this to allow acceptable levels of daylighting?	Yes
Security - Are there any	Single storey ground floor units	Yes
security issues that could		
limit opening of windows for ventilation?	Vulnerable areas identified by the Police Architectural Liaison Officer	TBC
	Other	TBC

4.45 Section 2 of the GLA's overheating checklist is provided below.

Table 4.9 Site features affecting vulnerability to overheating

Section 2 – Design features in	nplemented to mitigate overheating risk	Yes or No
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	No
	Will green roofs be provided?	Yes
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	Yes
Materials	Have high albedo (light colour) materials been specified?	Yes
Dwelling aspect	% of total units that are single aspect	7%
	% of single aspect with N / NE / NW orientation	0%
	% of single aspect with E orientation	0%
	% of single aspect with S / SE / SW orientation	100%
	% of single aspect with W orientation	0%
Daylighting	What is the average daylight factor range?	Scheme will target BRE ADF levels:
Window opening	Are the windows openable	Yes
Window opening	What is the average percentage openable area for the windows?	26-89%
Window opening – What is the extent of the opening	Fully openable	Variable

	Limited (e.g. for security, safety, wind loading	Limited for
	reasons)	safety where appropriate
Security	Where there are security issues (e.g. ground	Ventilation
	floor flats) has an alternative night time	grates provided
	natural ventilation method been provided	if necessary
	(e.g. ventilation grates)?	
Shading	Is there any external shading?	Yes – inset
		balconies
	Is there any internal shading?	Yes – blinds
Glazing specification	Is there any solar control glazing?	Yes to limit g-
		value to 0.53
Ventilation - What is the	Natural – background	No
ventilation strategy?		
	Natural – purge	Yes – opening
		windows
	Mechanical – background	MVHR specified
	Mechanical – purge	No
	What is the average design air change rate?	~1.5 ach
Heating system	Is communal heating present?	Yes
	What is the flow/return temperature?	65°C/60°C
	Have horizontal pipe runs been minimised?	TBC following detailed design
	Do the specifications include insulation levels in line with the London Heat Network Manual?	TBC following detailed design

- 4.46 An overheating assessment of a sample of eight of the residential apartments has been carried out using dynamic thermal modelling. This assessment has employed the guidance set out in CIBSE TM59 to reliably model overheating in residential properties. The overheating assessment made use of the Design Summer Years for London specified in CIBSE TM49 to predict overheating risk for three different weather scenarios.
 - DSY1. 1989: a moderately warm summer (current design year for London).
 - DSY2. 1976: a year with a prolonged period of sustained warmth.
 - DSY3. 2003: a year with a very intense single warm spell.
- 4.47 To account for the urban heat island effect in the locality of the development, weather data from the London Weather Centre has been employed as the basis for the analysis, as this location most closely matches Camden as a higher density urban area.
- 4.48 The risk of overheating has been assessed using the guidance contained in CIBSE TM52, which details the limits of thermal comfort.
- 4.49 Full details of the overheating assessment are provided in Appendix A5, and a summary is given below.
- 4.50 All dwellings pass the TM59 overheating criteria for the DSY1 and DSY3 weather files. For the DSY2 scenario, failures are predicted for two of the eight bedrooms tested. However, the extent of the failure is not significant, with a 1.3% exceedance of target temperatures, compared with the guidance target exceedance of 1.0%.
- 4.51 If overheating was found to be an issue in future for these dwellings, the following mitigation measures should be explored:
 - Retrofitted solar control film to minimise solar gain
 - Additional external shading to limit solar gain
 - Improved blinds to reduce solar gain
 - Increased MVHR flow rates for additional purge ventilation
 - Use of free standing fans
 - Ventilation grilles for ground floor dwellings

5. SUMMARY AND CONCLUSIONS

- 5.1 This Energy Statement provides an overview as to how the proposed development at Belmont Street contributes to achieve CO₂ emissions reduction and gives an overview of the design proposals that will ensure the development operates in an energy efficient manner over the lifespan of the scheme.
- 5.2 Section 4 of this statement demonstrates that the siting and design of the proposals support relevant policy relating to energy guidelines set out by the Greater London Authority and the London Borough of Camden.
- 5.3 The energy assessment has shown that the proposed development will adopt the Mayor of London's 'Energy Hierarchy' and the proposed strategy shall achieve a 71% reduction in carbon dioxide emissions through on-site means alone.
- 5.4 The measures proposed at each level of the Energy Hierarchy are set out below.
- 5.5 The proposed 'Be Lean' measures include:
 - High levels of building fabric insulation to minimise heat loss
 - A balanced proportion of façade glazing to ensure natural daylight provision without increasing overheating risk
 - High levels of air tightness to reduce heat loss through infiltration
 - The use of accredited construction details to minimise heat loss through thermal bridging
 - Low energy LED lighting to minimise artificial lighting energy consumption
 - Mechanical ventilation with heat recovery to provide fresh air, with heat recovered from extract air
 - A high specification of heating controls to ensure operational efficiency
- 5.6 The 'Be Green' measures include:
 - Employment of a highly efficient, communal air source heat pump (ASHP) system
 - 202 roof-top PV panels to provide renewable energy
- 5.7 The level of site-wide emissions reduction achieved for each stage of the Energy Hierarchy is shown below.

Figure 5.1 Site-wide regulated carbon dioxide emissions and savings

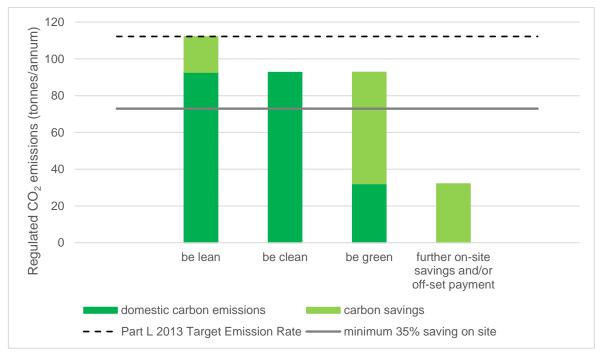


Table 5.1 Site-wide carbon dioxide emissions after each stage of the Energy Hierarchy

	Site-wide carbon dioxide e ann	missions (Tonnes CO₂ per um)
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	112.2	114.4
After energy demand reduction	94.5	114.4
After renewable energy	32.7	114.4

Table 5.2 Site-wide regulated carbon dioxide emissions after each stage of the Energy Hierarchy

	Regulated domestic ca	arbon dioxide savings
	(Tonnes CO₂ per annum)	(%)
Savings from energy demand reduction	17.7	16%
Savings from renewable energy	61.7	55%
Cumulative on-site savings	79.4	71%
Annual savings from offset payment (residential element)	32.7	
	(Tonne	es CO ₂)
Cumulative savings for offset payment	98	32
Cash in-lieu contribution	£93,	,324

- The assessment concludes that the proposals have maximised all available opportunities for on-site regulated carbon emissions reduction. The proposed energy strategy achieves an on-site emissions reduction of 71%. 982 tonnes of CO₂ per annum of residential emissions from the development are proposed to be offset through a cash-in-lieu contribution.
- 5.9 Overall, the proposals for the scheme are in line with the policy requirements of the planning authority for energy statements and will provide a development that seeks to promote these principles in operation.

A1. SITE PLAN

1



A2. DER/TER WORKSHEETS

				User D	etails:						
Assessor Name:					Strom						
Software Name:	Stron	na FSAP	_• -		Softwa				Versio	n: 1.0.4.26	
			F	Property	Address	C84_B	e Lean				
Address: 1. Overall dwelling dime	oncione:										
1. Overall dwelling diffe	511310113.			Δre	a(m²)		Av He	ight(m)		Volume(m	3)
Ground floor						(1a) x		2.8	(2a) =	343) (3a
Total floor area TFA = (1	a)+(1h)+	-(1c)+(1d)-	+(1e)+ (1	n)	22.5	(4)]		
	۵,۰(۱۵)۰	(10):(10)	. (10)		22.5)+(3c)+(3d)_(30)_	(3n) -		— ,_,
Dwelling volume						(3a) + (3b)+(30)+(30	i)+(3 e)+	.(311) =	343	(5)
2. Ventilation rate:	ma	ain	seconda	rv	other		total			m³ per hou	ır
		ating	heating	-		, –	totai		40	per nec	
Number of chimneys		0	0	_] +	0] = [0	X 4	40 =	0	(6a
Number of open flues		0	0	+	0	_ = _	0	x 2	20 =	0	(6b
Number of intermittent fa	ans						0	X '	10 =	0	(7a
Number of passive vents	3					Γ	0	x '	10 =	0	(7b
Number of flueless gas f	ires					Ē	0	X 4	40 =	0	(7c
									Air ch	nanges per h	our
Infilt <mark>ration</mark> due to chi <mark>mne</mark>							0		÷ (5) =	0	(8)
If a pressurisation test has t			tended, procee	ed to (17),	otherwise (continue fr	om (9) to ((16)			
Number of storeys in t Additional infiltration	ne awelli	ing (ns)						[(Q)]	-1]x0.1 =	0	(9) (10
Structural infiltration: 0).25 for s	teel or tim	ber frame o	r 0.35 fo	r masoni	v constr	ruction	[(9)	-1]XU.1 =	0	= (10 (11
if both types of wall are p						•				Ŭ	
deducting areas of openi				4 (222)	ما ام	t O					
If suspended wooden If no draught lobby, en		•	,	. i (seaie	ea), eise	enter 0				0	(12
Percentage of window	,									0	(14
Window infiltration	o ana ao	oro araagi	iii oiiippou		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	= (16
Air permeability value,	q50, exp	pressed in	cubic metre	es per ho	our per s	quare m	etre of e	nvelope	area	3	(17
lf based on air permeabi	lity value	e, then (18)	= [(17) ÷ 20]+(8), otherw	ise (18) = (16)				0.15	(18
Air permeability value applie		surisation tes	st has been do	ne or a de	gree air pe	rmeability	is being u	sed	1	<u> </u>	— .
Number of sides sheltere Shelter factor	ed				(20) = 1 -	0.075 x (1	19)1 =			0.85	(19
Infiltration rate incorpora	tina shelt	ter factor			(21) = (18		/,1				(21
Infiltration rate modified	•		peed		, , (/				0.13	(~
Jan Feb	Mar	'	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	-		<u> </u>	1	1		1	ı .		I	
(22)m= 5.1 5	4.9	4.4 4.	3 3.8	3.8	3.7	4	4.3	4.5	4.7		
				1	1	<u> </u>	1	I		I	
Wind Factor (22a)m = (2	2)m ÷ 4				·		•		1	1	
(22a)m= 1.27 1.25	1.23	1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rate	e (allowi	ing for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		-	rate for t	he appli	cable ca	se					•		
If exhaust air h			andiv N (2	13h) - (23	a) v Emy (4	aguation (I	NSN other	nvice (23h) = (232)			0.5	(23a
If balanced with) = (23a)			0.5	(23b
		-	-	_					2b\m . /′	22h) [1 (220)	76.5	(230
a) If balance (24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	+ 100j	(24a
b) If balance	ļ	ļ	Į	<u> </u>	Į	<u> </u>	ļ				0.21		(= :-
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h		tract ver		or nositiv		ventilatio	n from c	utsida					,
,				•	•				5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural	ventilatio	on or wh	ole hous	se positi	ve input	ventilatio	on from I	oft				•	
if (22b)r	n = 1, the	en (24d)	m = (221)	b)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			Ī	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air			`	í `	ŕ	``	· ·	<u> </u>				İ	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and he	eat loss	parai <mark>net</mark>	er:									
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/k	<)	k-value kJ/m²-l		A X k kJ/K
Doo <mark>rs Ty</mark> pe 1					2.1	x	1.3	= [2.73				(26)
Doo <mark>rs Ty</mark> pe 2					4	x	1.3] =	5.2				(26)
Doors Type 3					2.3	X	1	_ =	2.3	Ī			(26)
Windows Type	e 1				3.2	x1	/[1/(1.3)+	0.04] =	3.95	5			(27)
Windows Type	e 2				1.9	x1	/[1/(1.3)+	0.04] =	2.35				(27)
Windows Type	e 3				4.3	x1	/[1/(1.3)+	0.04] =	5.31				(27)
Windows Type	e 4				4	x1	/[1/(1.3)+	0.04] =	4.94				(27)
Windows Type	e 5				3.3	x1	/[1/(1.3)+	0.04] =	4.08				(27)
Windows Type	e 6				3.3	x1	/[1/(1.3)+	0.04] =	4.08				(27)
Windows Type	e 7				1.3	x1	/[1/(1.3)+	0.04] =	1.61				(27)
Floor					122.5	x	0.1		12.25	=		–	(28)
Walls	78.9	06	29.7	,	49.26	=	0.15	=	7.39	=		-	(29)
Total area of e					201.4	=							(31)
* for windows and ** include the area	l roof wind	ows, use e			alue calcul		g formula 1.	/[(1/U-valu	ıe)+0.04] a	s given in	n paragraph	3.2	` '
Fabric heat los				•			(26)(30)	+ (32) =				56.19	(33)
			-					((20)	(20) + (22))	(2.2.)		
Heat capacity		(Axk)						((20)	(30) + (32	(32a)	(32e) =	22834.	4 (34)
Heat capacity Thermal mass	Cm = S(,	⊃ = Cm -	: TFA) ir	n kJ/m²K				tive Value:	, , ,	(32e) =		
Thermal mass	Cm = S(parame sments wh	ter (TMI ere the de	tails of the	•			ecisely the	Indica	tive Value:	Medium		22834. 250	(34)
Thermal mass	Cm = S(parame sments wh	ter (TMF ere the de tailed calc	etails of the ulation.	construct	ion are no	t known pi	recisely the	Indica	tive Value:	Medium			

if details of therma	0 0	are not kn	own (36) =	= 0.05 x (3	1)			(33) 1	(36) =				— (27)
Ventilation hea		alculator	l monthly	,				` '		25)m x (5)		66.26	(37)
	Feb				lup	lul	Λιια	Sep		1			
(38)m= 31.7	31.34	Mar 30.98	Apr 29.17	May 28.81	Jun 27.01	Jul 27.01	Aug 26.65	27.73	Oct 28.81	Nov 29.54	30.26		(38)
			29.17	20.01	27.01	27.01	20.03			<u> </u>	30.20		(00)
Heat transfer of						1			= (37) + (·		l	
(39)m= 97.96	97.6	97.24	95.43	95.07	93.27	93.27	92.91	93.99	95.07	95.8	96.52		–
Heat loss para	matar (F	41 D) \\//	m²K						Average = = (39)m ÷	Sum(39) ₁	12 /12=	95.34	(39)
(40)m= 0.8	0.8	0.79	0.78	0.78	0.76	0.76	0.76	0.77	0.78	0.78	0.79		
(40)111= 0.0	0.0	0.73	0.70	0.70	0.70	1 0.70	0.70			Sum(40) ₁		0.78	(40)
Number of day	s in moi	nth (Tab	le 1a)					,	- verage	Sum(40)1.	12 / 12-	0.70	(.0)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ina enei	rav reaui	rement								kWh/ye	ear:	
ii water neat		gy roqui									TOTAL STATE	Jan.	
Assumed occu			[4	(0 0000	10 /T	- 40.0	\0\1 · 0 (2040 /	FF		87		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 X	[1 - exp	(-0.0003	349 X (11	-A -13.9)2)] + 0.0)013 x (IFA -13.	.9)			
Annual averag		ter usa	ge in litre	s per da	v Vd.av	erage =	(25 x N)	+ 36		10	2.42		(43)
Reduce the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o				(- /
not more that 125	litres per _l	person per	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 112.66	108.57	104.47	100.37	96.28	92.18	92.18	96.28	100.37	104.47	108.57	112.66		
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1 <mark>2</mark> 29.06	(44)
(45)m= 167.08	146.13	150.79	131.46	126.14	108.85	100.87	115.74	117.13	136.5	149	161.8		
		ļ				<u> </u>	!		Γotal = Su	m(45) ₁₁₂ =	! =	1611.49	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			, ,			
(46)m= 25.06	21.92	22.62	19.72	18.92	16.33	15.13	17.36	17.57	20.48	22.35	24.27		(46)
Water storage					•	•					•		
Storage volum	` ,					•		ame ves	sel		0		(47)
If community h	•			•			, ,						
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		oclared b	oss fact	or ie kno	wn (k\//k	n/day/):					0	1	(40)
•				טווא פו וכ	wii (Kvvi	i/uay).					0		(48)
Temperature fa							(40) (40)				0		(49)
Energy lost fro b) If manufact		•	-		or is not		(48) x (49)) =		1	10		(50)
Hot water stora			•							0	02		(51)
If community h	_			(• ·		• /					~ -		(=.)
Volume factor	_									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) or (_	Ĭ							-	03		(55)
												1	

Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	n
(62)m= 222.35 196.05 206.07 184.96 181.42 162.34 156.14 171.02 170.62 191.78 202.49 217.08	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 222.35 196.05 206.07 184.96 181.42 162.34 156.14 171.02 170.62 191.78 202.49 217.08	
Output from water heater (annual) 112 2262.33	(64)
Heat gains from water heating, kWh/month 0.25 [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 99.77 88.53 94.36 86.51 86.16 78.99 77.76 82.71 81.74 89.61 92.34 98.02	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):	
5. Internal gains (see Table 5 and 5a):	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	(66)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62	(66) (67)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.6	, ,
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	, ,
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.6	(67)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.6	(67) (68)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.6	(67) (68)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67) (68) (69)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.6	(67) (68) (69)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.6	(67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.6	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67) (68) (69) (70) (71)
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.6	(67) (68) (69) (70) (71)

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

Orienta	tion:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	3.2	x	10.63	x	0.53	x	0.7	=	8.75	(74)
North	0.9x	0.77	х	1.9	x	10.63	x	0.53	х	0.7	=	5.19	(74)
North	0.9x	0.77	x	4.3	x	10.63	x	0.53	х	0.7	=	11.76	(74)
North	0.9x	0.77	x	4	x	10.63	x	0.53	x	0.7] =	10.94	(74)
North	0.9x	0.77	х	3.3	x	10.63	x	0.53	х	0.7	=	9.02	(74)
North	0.9x	0.77	x	3.3	x	10.63	x	0.53	х	0.7	=	9.02	(74)
North	0.9x	0.77	x	1.3	x	10.63	x	0.53	х	0.7	=	3.55	(74)
North	0.9x	0.77	x	3.2	x	20.32	x	0.53	x	0.7	=	16.72	(74)
North	0.9x	0.77	x	1.9	x	20.32	x	0.53	х	0.7	=	9.93	(74)
North	0.9x	0.77	x	4.3	x	20.32	x	0.53	x	0.7	=	22.47	(74)
North	0.9x	0.77	x	4	x	20.32	x	0.53	x	0.7	=	20.9	(74)
North	0.9x	0.77	x	3.3	x	20.32	x	0.53	x	0.7	=	17.24	(74)
North	0.9x	0.77	x	3.3	x	20.32	x	0.53	x	0.7	=	17.24	(74)
North	0.9x	0.77	x	1.3	x	20.32	x	0.53	x	0.7	=	6.79	(74)
North	0.9x	0.77	x	3.2	x	34.53	x	0.53	x	0.7	=	28.41	(74)
North	0.9x	0.77	X	1.9	X	34.53	X	0.53	X	0.7] =	16.87	(74)
North	0.9x	0.77	x	4.3	x	34.53	x	0.53	x	0.7		38.17	(74)
North	0.9x	0.77	x	4	х	34.53] x	0.53	x	0.7	=	35.51	(74)
North	0.9x	0.77	x	3.3	x	34.53	x	0.53	x	0.7	=	29.3	(74)
North	0.9x	0.77	x	3.3	x	34.53	x	0.53	x	0.7	=	29.3	(74)
North	0.9x	0.77	x	1.3	x	34.53	×	0.53	x	0.7	=	11.54	(74)
North	0.9x	0.77	x	3.2	x	55.46	x	0.53	x	0.7	=	45.63	(74)
North	0.9x	0.77	x	1.9	X	55.46	X	0.53	X	0.7	=	27.09	(74)
North	0.9x	0.77	x	4.3	X	55.46	X	0.53	X	0.7	=	61.32	(74)
North	0.9x	0.77	x	4	X	55.46	X	0.53	x	0.7	=	57.04	(74)
North	0.9x	0.77	x	3.3	x	55.46	x	0.53	X	0.7	=	47.06	(74)
North	0.9x	0.77	x	3.3	x	55.46	x	0.53	x	0.7	=	47.06	(74)
North	0.9x	0.77	x	1.3	X	55.46	x	0.53	X	0.7	=	18.54	(74)
North	0.9x	0.77	x	3.2	X	74.72	X	0.53	X	0.7	=	61.47	(74)
North	0.9x	0.77	x	1.9	X	74.72	x	0.53	X	0.7	=	36.5	(74)
North	0.9x	0.77	x	4.3	X	74.72	x	0.53	X	0.7	=	82.6	(74)
North	0.9x	0.77	x	4	x	74.72	x	0.53	x	0.7	=	76.84	(74)
North	0.9x	0.77	x	3.3	X	74.72	x	0.53	X	0.7	=	63.39	(74)
North	0.9x	0.77	x	3.3	X	74.72	x	0.53	X	0.7	=	63.39	(74)
North	0.9x	0.77	x	1.3	x	74.72	x	0.53	x	0.7	=	24.97	(74)
North	0.9x	0.77	x	3.2	x	79.99	x	0.53	x	0.7	=	65.81	(74)
North	0.9x	0.77	x	1.9	x	79.99	x	0.53	x	0.7	=	39.07	(74)
North	0.9x	0.77	x	4.3	x	79.99	x	0.53	x	0.7	=	88.43	(74)
North	0.9x	0.77	X	4	X	79.99	×	0.53	X	0.7	=	82.26	(74)

	_		,						ı				_
North	0.9x	0.77	X	3.3	X	79.99	X	0.53	X	0.7	=	67.86	(74)
North	0.9x	0.77	X	3.3	X	79.99	X	0.53	X	0.7	=	67.86	(74)
North	0.9x	0.77	X	1.3	X	79.99	x	0.53	X	0.7	=	26.73	(74)
North	0.9x	0.77	X	3.2	X	74.68	X	0.53	X	0.7	=	61.44	(74)
North	0.9x	0.77	X	1.9	X	74.68	x	0.53	X	0.7	=	36.48	(74)
North	0.9x	0.77	X	4.3	X	74.68	x	0.53	X	0.7	=	82.56	(74)
North	0.9x	0.77	X	4	x	74.68	x	0.53	X	0.7	=	76.8	(74)
North	0.9x	0.77	x	3.3	x	74.68	x	0.53	x	0.7	=	63.36	(74)
North	0.9x	0.77	x	3.3	x	74.68	x	0.53	x	0.7	=	63.36	(74)
North	0.9x	0.77	x	1.3	x	74.68	x	0.53	x	0.7	=	24.96	(74)
North	0.9x	0.77	x	3.2	x	59.25	x	0.53	x	0.7	=	48.74	(74)
North	0.9x	0.77	x	1.9	x	59.25	x	0.53	x	0.7	=	28.94	(74)
North	0.9x	0.77	x	4.3	x	59.25	x	0.53	x	0.7	=	65.5	(74)
North	0.9x	0.77	x	4	x	59.25	x	0.53	x	0.7	=	60.93	(74)
North	0.9x	0.77	x	3.3	x	59.25	x	0.53	x	0.7	=	50.27	(74)
North	0.9x	0.77	X	3.3	x	59.25	x	0.53	x	0.7	=	50.27	(74)
North	0.9x	0.77	X	1.3	x	59.25	x	0.53	x	0.7	=	19.8	(74)
North	0.9x	0.77	X	3.2	X	41.52	Х	0.53	X	0.7	=	34.16	(74)
North	0.9x	0.77	x	1.9	x	41.52	x	0.53	x	0.7	=	20.28	(74)
North	0.9x	0.77	x	4.3	х	41.52] x	0.53	x	0.7	=	45.9	(74)
North	0.9x	0.77	x	4	X	41.52	x	0.53	x	0.7	=	42.7	(74)
North	0.9x	0.77	x	3.3	x	41.52	Х	0.53	x	0.7	=	35.22	(74)
North	0.9x	0.77	x	3.3	x	41.52	X	0.53	x	0.7	=	35.22	(74)
North	0.9x	0.77	X	1.3	х	41.52	x	0.53	X	0.7	=	13.88	(74)
North	0.9x	0.77	X	3.2	X	24.19	X	0.53	X	0.7	=	19.9	(74)
North	0.9x	0.77	X	1.9	X	24.19	x	0.53	X	0.7	=	11.82	(74)
North	0.9x	0.77	X	4.3	X	24.19	X	0.53	x	0.7	=	26.74	(74)
North	0.9x	0.77	X	4	X	24.19	x	0.53	X	0.7	=	24.88	(74)
North	0.9x	0.77	X	3.3	X	24.19	X	0.53	X	0.7	=	20.52	(74)
North	0.9x	0.77	X	3.3	x	24.19	X	0.53	x	0.7	=	20.52	(74)
North	0.9x	0.77	X	1.3	x	24.19	x	0.53	X	0.7	=	8.08	(74)
North	0.9x	0.77	X	3.2	X	13.12	x	0.53	X	0.7	=	10.79	(74)
North	0.9x	0.77	X	1.9	x	13.12	x	0.53	x	0.7	=	6.41	(74)
North	0.9x	0.77	X	4.3	x	13.12	x	0.53	x	0.7	=	14.5	(74)
North	0.9x	0.77	X	4	X	13.12	X	0.53	X	0.7	=	13.49	(74)
North	0.9x	0.77	x	3.3	x	13.12	x	0.53	x	0.7	=	11.13	(74)
North	0.9x	0.77	x	3.3	x	13.12	x	0.53	x	0.7	=	11.13	(74)
North	0.9x	0.77	x	1.3	x	13.12	x	0.53	x	0.7	=	4.38	(74)
North	0.9x	0.77	x	3.2	x	8.86	x	0.53	x	0.7	=	7.29	(74)
North	0.9x	0.77	x	1.9	x	8.86	x	0.53	X	0.7	=	4.33	(74)
North	0.9x	0.77	X	4.3	×	8.86	x	0.53	X	0.7	=	9.8	(74)

North	0.9x	0.77	X	4	ļ	x	3	8.86	x		0.53	x	0.7	=	9.12	(74)
North	0.9x	0.77	х	3.	3	x	1	8.86	x		0.53	х	0.7		7.52	(74)
North	0.9x	0.77	x	3.	3	x	-	8.86	x		0.53	x	0.7		7.52	(74)
North	0.9x	0.77	x	1.	3	x		8.86	x		0.53	_ x _	0.7	=	2.96	(74)
	_															
Solar	gains in	watts, ca	alculated	d for eac	h month				(83)m	n = Si	um(74)m .	(82)m				
(83)m=	58.23	111.28	189.1	303.74	409.17	4	38.02	408.95	324	.45	227.36	132.47	71.84	48.54		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (83)m	, watts					•			
(84)m=	572.57	623.37	684.47	771.86	849.13	8	351.2	804.92	726	.95	644.03	576.62	547.62	548.52		(84)
7. Me	an inter	nal temp	erature	(heating	season)										
		during h		·			area	from Tal	ole 9	, Th	1 (°C)				21	(85)
•		tor for g				•				,	` ,					`
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.98	0.89	-	0.68	0.51	0.5	Ť	0.88	0.99	1	1		(86)
		1.1		l			-1-				- 0 -)		<u> </u>	<u> </u>		
		l temper			- `	_		i 				20.00	00.00	00.40		(87)
(87)m=	20.13	20.22	20.4	20.67	20.9		20.99	21	2	1	20.93	20.66	20.36	20.12		(07)
Temp	erature	during h	eating p	eriods ir	rest of	dw	/elling	from Ta	ble 9	9, Tł	n2 (°C)				•	
(88)m=	20.25	20.26	20.26	20.27	20.27	_2	20.29	20.29	20.	29	20.28	20.27	20.27	20.26		(88)
Util <mark>isa</mark>	ation fac	tor for g	ains for	rest of d	welling,	h2	,m (se	ee Tabl <mark>e</mark>	9a)							
(89)m=	1	1	0.99	0.97	0.86		0.61	0.43	0.	5	0.83	0.99	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ina	T2 (f	ollow ste	ns 3	to 7	7 in Tabl	e 9c)				
(90)m=	19.07	19.2	19.47	19.87	20.17	Ť	20.28	20.29	20.	$\overline{}$	20.22	19.85	19.41	19.06		(90)
											f	LA = Livin	g area ÷ (4	4) =	0.4	(91)
N40 010	intorno	Lannan	atuma (fa	مارين م ما د س	ميراه مام	11:	د د	Ι Δ Τ4	. /4	£ı	A) TO					
(92)m=	19.49	temper	19.85	20.19	20.46	_	9) = 11 20.56	20.57	+ (1 20.		20.51	20.17	19.79	19.49		(92)
` '		nent to the		ļ i		_							10.75	10.40		(02)
(93)m=	19.49	19.61	19.85	20.19	20.46	_	20.56	20.57	20.		20.51	20.17	19.79	19.49		(93)
		iting requ			20110			20.01		<u> </u>	20.0	20111	10.10	10110		
		mean int			re obtair	ned	l at ste	ep 11 of	Tabl	le 9t	o, so tha	t Ti.m=(76)m an	d re-calo	culate	
		factor fo		•				ор о. 			, 00	, (
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:											•	
(94)m=	1	1	0.99	0.97	0.87		0.64	0.46	0.5	53	0.84	0.98	1	1		(94)
	ıl gains,	hmGm ,	W = (9)	4)m x (8	4)m	_									•	
(95)m=	572.03	622.17	680.35	748.62	735.22		46.44	369.74	385	.63	543.77	567.6	546.41	548.13		(95)
		age exte		i	from T	$\overline{}$									I	
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16		14.1	10.6	7.1	4.2		(96)
		e for mea				_		-``							1	(0-)
. ,		1436.11	1297.7	1077.55		_	56.23	370.56	387		602.31	910.3	1215.6	1475.33		(97)
•		g require		1	r	vvh T				Ó	<u> </u>	<u>`</u>	ŕ	000.04	1	
(98)m=	681.74	546.96	459.31	236.83	72.67		0	0	(0	254.97	481.82	689.84		(00)
										ıota	l per year	(KVVh/year	r) = Sum(9	8) _{15,912} =	3424.15	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year										27.95	(99)

9b. Energy requirements – Community heating scheme		mmunity scheme		
This part is used for space heating, space cooling or wa Fraction of space heat from secondary/supplementary h		mmunity scheme.	0	(301)
Fraction of space heat from community system 1 – (301	1) =		1	(302)
The community scheme may obtain heat from several sources. The p		four other heat sources	; the latter	
includes boilers, heat pumps, geothermal and waste heat from power Fraction of heat from Community boilers	stations. See Appendix C.		1	(303a)
Fraction of total space heat from Community boilers		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for	r community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating	ng system		1.05	(306)
Space heating			kWh/yea	 r
Annual space heating requirement			3424.15	
Space heat from Community boilers	(98) x (304a) x	x (305) x (306) =	3595.36	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Appe	ndix E)	0	(308
Space heating requirement from secondary/supplement	tary system (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating				_
Annual water heating requirement			2262.33	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a)	(305) x (306) =	2375.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	59.71	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not e	enter 0) = (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f) mechanical ventilation - balanced, extract or positive in			319.08	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	319.08	(331)
Energy for lighting (calculated in Appendix L)			454.09	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	r Emissions kg CO2/year	
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	ot CHP) CHP using two fuels repeat (363) to	o (366) for the second fu	uel 90	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	= 1432.99	(367)
Electrical energy for heat distribution	[(313) x	0.52	30.99	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	72)	= 1463.98	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or in	stantaneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		1463.98	(376)

CO2 associated with electricity for pumps and fans within dwelling (331)) x 165.6 (378)0.52 CO2 associated with electricity for lighting (379) (332))) x 235.67 0.52 Total CO2, kg/year sum of (376)...(382) = (383) 1865.25 $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)15.23 El rating (section 14) (385) 85.08

		User [Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	Droposte	Strom Softwa	are Ve	rsion:		Versio	on: 1.0.4.26	
Address :		Property	Address	: C84_B	e Lean				
1. Overall dwelling dime	ensions:								
0 40			a(m²)	Ī	Av. He	ight(m)	7	Volume(m	<u> </u>
Ground floor			122.5	(1a) x	2	2.8	(2a) =	343	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	122.5	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	343	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	= [0	X	40 =	0	(6a)
Number of open flues	0 + 0	= + F	0	Ī = [0	X	20 =	0	(6b)
Number of intermittent fa	ns				4	x	10 =	40	(7a)
Number of passive vents				F	0	x	10 =	0	(7b)
Number of flueless gas fi	res			<u> </u>	0	X	40 =	0	(7c)
							Air ch	nanges per h	
	ys, flues and fans = (6a)+(6b)+ een carried out or is intended, proce			continuo fi	40		\div (5) =	0.12	(8)
Number of storeys in the		eu 10 (17),	ourerwise (continue ir	OIII (9) 10 ((10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are pu deducting areas of openin	resent, use the value corresponding	to the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2		-			0	(15)
Infiltration rate					12) + (13) ·			0	(16)
•	q50, expressed in cubic met	•	•	•	etre of e	envelope	area	5	(17)
•	ity value, then $(18) = [(17) \div 20]$ es if a pressurisation test has been d				is heina u	sed		0.37	(18)
Number of sides sheltere		one or a de	gree an pe	imcability	is being u	3CU		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (′	19)] =			0.85	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18) x (20) =				0.31	(21)
Infiltration rate modified f	or monthly wind speed								-
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7							,	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
,		1 3.00	1	<u> </u>			L•	J	

Adjusted infiltra	ation rate ((allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.4	0.39	0.38	0.34	0.33	0.3	0.3	0.29	0.31	0.33	0.35	0.37			
Calculate effec		_	rate for t	he appli	cable ca	se	•	•	•	•	•	<u>. </u>		٦.
If mechanica			andiv N. (2	2h) _ (22a) Em. (auation (I	VE)) otho	muiaa (22h) - (220)				0	(23a
If exhaust air he) = (23a)				0	(23b
If balanced with		-	-	_					.	001) [4 (00.)		0	(230
a) If balance	-				1	- 		 	<u> </u>) ÷ 100] 1		(246
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]		(24a
b) If balance					1			í `	r ´ `	- 	1 .	1		(0.41
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]		(24b
c) If whole he				-	-				E (22h	.\				
(24c)m = 0	$\frac{1 < 0.5 \times (2)}{0}$	23b), t	nen (240	(23L) = (23L)		MISE (24	$C_0 = (22)$) III + 0.	.5 × (23L	0	0	1		(240
(''					<u> </u>					0]		(2-10
d) If natural vi	ventilation n = 1, then				•				0.5]			-		
(24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(240
Effective air	change ra	ite - en	iter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)						
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(25)
3. Heat losses	and heat	loss r	narameta	or.					_		_		-	
ELEMENT	Gross	1033	Openin	gs	Net Ar	ea	U-val		AXU		k-valu		АХ	
	area (m	n²)	m	2	A ,r	n²	W/m2	2K\	(W/I	<u><)</u>	kJ/m²•	K	kJ/	K
Doo <mark>rs Ty</mark> pe 1					2.1	X	1.2	=	2.52					(26)
Doors Type 2					4	X	1.2	- [4.8					(26)
Doors Type 3					2.3	X	1	=	2.3					(26)
Windows Type	1				3.2	x1	/[1/(1.4)+	0.04] =	4.24					(27)
Windows Type	2				1.9	x1	/[1/(1.4)+	0.04] =	2.52					(27)
Windows Type	3				4.3	x1	/[1/(1.4)+	0.04] =	5.7					(27)
Windows Type	4				4	x1	/[1/(1.4)+	0.04] =	5.3	Ħ				(27)
Windows Type	5				3.3	x1	/[1/(1.4)+	0.04] =	4.37	一				(27)
Windows Type	6				3.3		/[1/(1.4)+	· 0.04] =	4.37	=				(27)
Windows Type					1.3		/[1/(1.4)+	Ļ	1.72	=				(27)
Floor	•					=				╡ ┌		\neg		(28)
Walls	70.00	_			122.5		0.13	=	15.925	<u> </u>		=		=
	78.96		29.7		49.26	=	0.18	=	8.87					(29)
Total area of e					201.4									(31)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	is given in	paragrapi	h 3.2		
Fabric heat los				pan			(26)(30) + (32) =				6	2.65	(33)
Heat capacity		•	,					((28)	(30) + (32	2) + (32a).	(32e) =		834.4	(34)
Thermal mass	,	•	P = Cm ÷	- TFA) ir	n kJ/m²K			., ,	tive Value	, , ,	. ,		250	(35)
For design assess	•	,		,			ecisely the				able 1f		_00	(۵۵)
-						•	•							
can be used instea	ad of a detail	ed calcu	ılatıon.											_

if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric hea	at loss							(33) +	(36) =			72.72	(37)
Ventilation hea	at loss ca	alculated	monthl	/	1	,	•	(38)m	= 0.33 × (25)m x (5))	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 65.53	65.18	64.84	63.25	62.95	61.56	61.56	61.3	62.09	62.95	63.55	64.18		(38)
Heat transfer of	oefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 138.25	137.9	137.56	135.97	135.67	134.28	134.28	134.02	134.81	135.67	136.27	136.9		
Heat loss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷		12 /12=	135.96	(39)
(40)m= 1.13	1.13	1.12	1.11	1.11	1.1	1.1	1.09	1.1	1.11	1.11	1.12		
							•		Average =	Sum(40) ₁	12 /12=	1.11	(40)
Number of day			le 1a)		<u> </u>	ı	ī		<u> </u>	<u> </u>	ı	l	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	ipancy, I	N								2	.87		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.01		(:=)
if TFA £ 13.9		40	ua in litua	o nou da	\/ d a		(05 × N)	. 20					(10)
Annual averag Reduce the annua									se target o		2.42		(43)
not m <mark>ore th</mark> at 125	litres per p	person per	day (all w	rater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 112.66	108.57	104.47	100.37	96.28	92.18	92.18	96.28	100.37	104.47	108.57	112.66		
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600		Total = Su oth (see Ta			1229.06	(44)
(45)m= 167.08	146.13	150.79	131.46	126.14	108.85	100.87	115.74	117.13	136.5	149	161.8		
		ļ		<u> </u>	ļ	<u> </u>	<u>!</u>		rotal = Su	<u>I</u>	! =	1611.49	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)			'		
(46)m= 25.06	21.92	22.62	19.72	18.92	16.33	15.13	17.36	17.57	20.48	22.35	24.27		(46)
Water storage					/\/\ IDO		10.1		1			· I	
Storage volum	` ,		•			_		ame ves	sei		150		(47)
If community h Otherwise if no	•			•			` '	are) anto	or 'O' in <i>(</i>	17 \			
Water storage		not wate	i (uno n	iciuues i	nstantai	ieous cc	JITIDI DOII	croj crite	51 0 111 (71)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	.39		(48)
Temperature fa	actor fro	m Table	2b							0.	.54		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	.75		(50)
b) If manufact	urer's de	eclared o	ylinder l	oss fact							-		` '
Hot water stora	•			e 2 (kW	h/litre/da	ay)					0		(51)
If community h Volume factor	_		on 4.3								0	1	(50)
Temperature fa			2b							—	0		(52) (53)
Energy lost fro				aar			(A7) v (51)	v (52) v (53) –			[[
Enter (50) or (_	, KVVII/YE	zai			(47) x (51)	, A (JZ) X (00 <i>j</i> =	-	0 .75		(54) (55)
5. (50) 51 (, (0	/											(00)

Water storage loss calculate	d for each	month			((56)m = (55) × (41)ı	m				
(56)m= 23.33 21.07 23.33	3 22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains dedicated solar	storage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33 21.07 23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit loss (annual)	from Table	∋ 3							0		(58)
Primary circuit loss calculate	d for each	month (59)m = ((58) ÷ 36	55 × (41)	m					
(modified by factor from Ta	able H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.01 23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for ea	ch month	(61)m = ((60) ÷ 36	65 × (41))m						
(61)m= 0 0 0	0	0	0	0	0	0	0	0	0		(61)
Total heat required for water	heating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	ı
(62)m= 213.67 188.21 197.3	8 176.55	172.74	153.94	147.46	162.34	162.22	183.09	194.09	208.4		(62)
Solar DHW input calculated using A	ppendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	•	
(add additional lines if FGHR	S and/or \	WWHRS	applies	, see Ap	pendix (€)					
(63)m= 0 0 0	0	0	0	0	0	0	0	0	0		(63)
Output from water heater	-	-		-				-	-	•	
(64)m= 213.67 188.21 197.3	8 176.55	172.74	153.94	147.46	162.34	162.22	183.09	194.09	208.4		
					Outp	out from wa	ater heate	r (annual) ₁	12	2160.1	(64)
Heat gains from water heatir	g, kWh/m	onth 0.25	[0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m		
(65)m= 92.83 82.26 87.4°	79.78	70.22	70.07	70.04	76 70	75.00	00.00	<u> </u>	<u> </u>	1	(65)
(03) III= $\begin{bmatrix} 92.03 & 02.20 & 07.4 \end{bmatrix}$	19.10	79.22	7 2.27	70.81	75.76	75.02	8 <mark>2.66</mark>	85.62	91.08		(65)
include (57)m in calculatio									<u> </u>	eating	(65)
	n of (65)m	only if c							<u> </u>	eating	(65)
include (57)m in calculatio 5. Internal gains (see Table	n of (65)m s 5 and 5a	only if c							<u> </u>	eating	(65)
include (57)m in calculatio	n of (65)m e 5 and 5a atts	only if c							<u> </u>	eating	(65)
include (57)m in calculatio 5. Internal gains (see Table Metabolic gains (Table 5), W	n of (65)m s 5 and 5a atts r Apr	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	(66)
include (57)m in calculatio 5. Internal gains (see Table Metabolic gains (Table 5), W Jan Feb Ma	of (65)m of 5 and 5a atts r Apr 2 143.62	only if c:): May 143.62	Jun 143.62	Jul 143.62	Aug 143.62	Sep 143.62	ater is fr	om com	munity h	eating	
include (57)m in calculatio 5. Internal gains (see Table Metabolic gains (Table 5), W Jan Feb Ma (66)m= 143.62 143.62 143.6	of (65)m of and 5a atts r Apr 2 143.62 Appendix	only if c:): May 143.62	Jun 143.62	Jul 143.62	Aug 143.62	Sep 143.62	ater is fr	om com	munity h	eating	
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Mare Mare Mare Mare Mare Mare Mare Mare	n of (65)m e 5 and 5a fatts r Apr 2 143.62 Appendix r 14.06	only if control only if contro	Jun 143.62 on L9 or	Jul 143.62 r L9a), a 9.59	Aug 143.62 Iso see	Sep 143.62 Table 5	Oct 143.62	Nov	Dec	eating	(66)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Mark (66)m= 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.55	of (65)m of (65)m of and 5a ratts r Apr 2 143.62 Appendix r 14.06 in Append	only if control only if contro	Jun 143.62 on L9 or	Jul 143.62 r L9a), a 9.59	Aug 143.62 Iso see	Sep 143.62 Table 5	Oct 143.62	Nov	Dec	eating	(66)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Mare (66)m= 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.53 Appliances gains (calculated (68)m= 288.43 291.43 283.83	of (65)m of (65)m of and 5a datts r Apr 2 143.62 Appendix r 14.06 in Appendix 8 267.83	only if control of the control of th	Jun 143.62 on L9 o 8.87 uation L 228.51	Jul 143.62 r L9a), a 9.59 13 or L1 215.78	Aug 143.62 Iso see 12.46 3a), also 212.79	Sep 143.62 Table 5 16.73 see Tal 220.33	Oct 143.62 21.24 ble 5 236.39	Nov 143.62 24.79	Dec 143.62	eating	(66) (67)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Ma (66)m= 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.55 Appliances gains (calculated	n of (65)m e 5 and 5a atts r Apr 2 143.62 Appendix r 14.06 in Appendix 8 267.83 Appendix	only if control of the control of th	Jun 143.62 on L9 o 8.87 uation L 228.51	Jul 143.62 r L9a), a 9.59 13 or L1 215.78	Aug 143.62 Iso see 12.46 3a), also 212.79	Sep 143.62 Table 5 16.73 see Tal 220.33	Oct 143.62 21.24 ble 5 236.39	Nov 143.62 24.79	Dec 143.62	eating	(66) (67)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Ma (66)m= 143.62 143.62 143.6 Lighting gains (calculated in (67)m= 25.71 22.84 18.5) Appliances gains (calculated (68)m= 288.43 291.43 283.8) Cooking gains (calculated in calculated in calcula	atts Apr 143.62 Appendix 14.06 in Appendix 267.83 Appendix 37.36	only if control of the control of th	Jun 143.62 on L9 on 8.87 uation L 228.51 ion L15	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a)	Aug 143.62 Iso see 12.46 3a), also 212.79	Sep 143.62 Table 5 16.73 see Tal 220.33	Oct 143.62 21.24 ble 5 236.39 5	Nov 143.62 24.79	Dec 143.62 26.43	eating	(66) (67) (68)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Ma (66)m= 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.55 Appliances gains (calculated in (68)m= 288.43 291.43 283.8 Cooking gains (calculated in (69)m= 37.36 37.36 37.36	atts Apr 143.62 Appendix 14.06 in Appendix 267.83 Appendix 37.36	only if control of the control of th	Jun 143.62 on L9 on 8.87 uation L 228.51 ion L15	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a)	Aug 143.62 Iso see 12.46 3a), also 212.79	Sep 143.62 Table 5 16.73 see Tal 220.33	Oct 143.62 21.24 ble 5 236.39 5	Nov 143.62 24.79	Dec 143.62 26.43	eating	(66) (67) (68)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Ma (66)m= 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.55 Appliances gains (calculated in (68)m= 288.43 291.43 283.8 Cooking gains (calculated in (69)m= 37.36 37.36 37.36 Pumps and fans gains (Table (70)m= 3 3 3 3	of (65)m atts r Apr 2 143.62 Appendix r 14.06 in Appendix 8 267.83 Appendix 3 37.36 a 5a) 3	only if control only if contro	Jun 143.62 on L9 on 8.87 uation L 228.51 ion L15 37.36	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36	Sep 143.62 Table 5 16.73 see Tal 220.33 ee Table 37.36	Oct 143.62 21.24 ble 5 236.39 5 37.36	Nov 143.62 24.79 256.66	Dec 143.62 26.43 275.71 37.36	eating	(66) (67) (68) (69)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Mare (66)m= 143.62 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.52 Appliances gains (calculated in (68)m= 288.43 291.43 283.82 Cooking gains (calculated in (69)m= 37.36 37.36 37.36 Pumps and fans gains (Table	of (65)m of	only if control only if contro	Jun 143.62 on L9 on 8.87 uation L 228.51 ion L15 37.36	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36	Sep 143.62 Table 5 16.73 see Tal 220.33 ee Table 37.36	Oct 143.62 21.24 ble 5 236.39 5 37.36	Nov 143.62 24.79 256.66	Dec 143.62 26.43 275.71 37.36	eating	(66) (67) (68) (69)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Ma (66)m= 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.55 Appliances gains (calculated in (68)m= 288.43 291.43 283.8 Cooking gains (calculated in (69)m= 37.36 37.36 37.36 Pumps and fans gains (Table (70)m= 3 3 3 3 Losses e.g. evaporation (neg	of (65)m of	only if control only if contro	Jun 143.62 on L9 o 8.87 uation L 228.51 ion L15 37.36	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36	Sep 143.62 Table 5 16.73 see Tal 220.33 ee Table 37.36	Oct 143.62 21.24 ble 5 236.39 5 37.36	Nov 143.62 24.79 256.66	Dec 143.62 26.43 37.36	eating	(66) (67) (68) (69) (70)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Margorian (66)m= 143.62 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.55 Appliances gains (calculated in (68)m= 288.43 291.43 283.86 Cooking gains (calculated in (69)m= 37.36 37.36 37.36 Pumps and fans gains (Table (70)m= 3 3 3 Losses e.g. evaporation (neg (71)m= -114.9 -114.9 -114.9	of (65)m of (65)m atts r Apr 2 143.62 Appendix 14.06 in Appendix 8 267.83 Appendix 37.36 e 5a) 3 gative valu 9 -114.9	only if control only if contro	Jun 143.62 on L9 o 8.87 uation L 228.51 ion L15 37.36	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36	Sep 143.62 Table 5 16.73 see Tal 220.33 ee Table 37.36	Oct 143.62 21.24 ble 5 236.39 5 37.36	Nov 143.62 24.79 256.66	Dec 143.62 26.43 37.36	eating	(66) (67) (68) (69) (70)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Ma (66)m= 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.55 Appliances gains (calculated in (68)m= 288.43 291.43 283.8 Cooking gains (calculated in (69)m= 37.36 37.36 37.36 Pumps and fans gains (Table (70)m= 3 3 3 3 Losses e.g. evaporation (neg (71)m= -114.9 -114.9 -114.9 -114.9	of (65)m of (65)m atts r Apr 2 143.62 Appendix 14.06 in Appendix 8 267.83 Appendix 37.36 e 5a) 3 gative valu 9 -114.9	only if control only if contro	Jun 143.62 on L9 o 8.87 uation L 228.51 ion L15 37.36 3 le 5) -114.9	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 a, also se 37.36 3	Sep 143.62 Table 5 16.73 see Tal 220.33 ee Table 37.36	Oct 143.62 21.24 ble 5 236.39 5 37.36 3 -114.9	Nov 143.62 24.79 256.66 37.36 3 -114.9	Dec 143.62 26.43 37.36 3 -114.9	eating	(66) (67) (68) (69) (70)
include (57)m in calculation 5. Internal gains (see Table Metabolic gains (Table 5), Ward Jan Feb Ma (66)m= 143.62 143.62 143.62 Lighting gains (calculated in (67)m= 25.71 22.84 18.55 Appliances gains (calculated in (68)m= 288.43 291.43 283.8 Cooking gains (calculated in (69)m= 37.36 37.36 37.36 Pumps and fans gains (Table (70)m= 3 3 3 3 Losses e.g. evaporation (neg (71)m= -114.9 -114.9 -114.9 -114.9 Water heating gains (Table 5 (72)m= 124.77 122.4 117.46	n of (65)m a 5 and 5a atts r Apr 2 143.62 Appendix r 14.06 in Appendix 8 267.83 Appendix 6 37.36 e 5a) gative valu 9 -114.9 ii) 9 110.81	only if control only if contro	Jun 143.62 on L9 o 8.87 uation L 228.51 ion L15 37.36 3 le 5) -114.9	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 a, also se 37.36 3	Sep 143.62 Table 5 16.73 see Tal 220.33 ee Table 37.36 3	Oct 143.62 21.24 ble 5 236.39 5 37.36 3 -114.9	Nov 143.62 24.79 256.66 37.36 3 -114.9	Dec 143.62 26.43 37.36 3 -114.9	eating	(66) (67) (68) (69) (70)

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

Orienta	tion:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	3.2	x	10.63	x	0.63	x	0.7] =	10.4	(74)
North	0.9x	0.77	х	1.9	x	10.63	x	0.63	x	0.7	=	6.17	(74)
North	0.9x	0.77	x	4.3	x	10.63	x	0.63	x	0.7	=	13.97	(74)
North	0.9x	0.77	x	4	x	10.63	x	0.63	x	0.7] =	13	(74)
North	0.9x	0.77	х	3.3	x	10.63	x	0.63	x	0.7	=	10.72	(74)
North	0.9x	0.77	x	3.3	x	10.63	x	0.63	x	0.7	=	10.72	(74)
North	0.9x	0.77	x	1.3	x	10.63	x	0.63	x	0.7	=	4.22	(74)
North	0.9x	0.77	x	3.2	x	20.32	x	0.63	x	0.7	=	19.87	(74)
North	0.9x	0.77	x	1.9	x	20.32	x	0.63	x	0.7	=	11.8	(74)
North	0.9x	0.77	x	4.3	x	20.32	x	0.63	x	0.7	=	26.7	(74)
North	0.9x	0.77	x	4	x	20.32	x	0.63	x	0.7	=	24.84	(74)
North	0.9x	0.77	x	3.3	x	20.32	x	0.63	x	0.7	=	20.49	(74)
North	0.9x	0.77	x	3.3	x	20.32	x	0.63	x	0.7	=	20.49	(74)
North	0.9x	0.77	x	1.3	x	20.32	x	0.63	x	0.7	=	8.07	(74)
North	0.9x	0.77	x	3.2	x	34.53	x	0.63	x	0.7	=	33.77	(74)
North	0.9x	0.77	x	1.9	X	34.53	X	0.63	X	0.7] =	20.05	(74)
North	0.9x	0.77	x	4.3	x	34.53	x	0.63	x	0.7		45.38	(74)
North	0.9x	0.77	x	4	х	34.53] x	0.63	x	0.7	=	42.21	(74)
North	0.9x	0.77	x	3.3	x	34.53	x	0.63	x	0.7	=	34.82	(74)
North	0.9x	0.77	x	3.3	x	34.53	х	0.63	x	0.7	=	34.82	(74)
North	0.9x	0.77	x	1.3	x	34.53	×	0.63	x	0.7	=	13.72	(74)
North	0.9x	0.77	x	3.2	x	55.46	x	0.63	x	0.7	=	54.24	(74)
North	0.9x	0.77	x	1.9	x	55.46	x	0.63	x	0.7	=	32.21	(74)
North	0.9x	0.77	x	4.3	x	55.46	x	0.63	x	0.7	=	72.89	(74)
North	0.9x	0.77	x	4	X	55.46	x	0.63	X	0.7	=	67.8	(74)
North	0.9x	0.77	x	3.3	x	55.46	x	0.63	x	0.7	=	55.94	(74)
North	0.9x	0.77	x	3.3	x	55.46	x	0.63	X	0.7	=	55.94	(74)
North	0.9x	0.77	x	1.3	X	55.46	X	0.63	X	0.7	=	22.04	(74)
North	0.9x	0.77	x	3.2	x	74.72	x	0.63	X	0.7	=	73.07	(74)
North	0.9x	0.77	x	1.9	X	74.72	X	0.63	X	0.7	=	43.38	(74)
North	0.9x	0.77	x	4.3	X	74.72	x	0.63	X	0.7	=	98.19	(74)
North	0.9x	0.77	x	4	x	74.72	x	0.63	x	0.7	=	91.34	(74)
North	0.9x	0.77	x	3.3	x	74.72	x	0.63	X	0.7	=	75.35	(74)
North	0.9x	0.77	x	3.3	x	74.72	x	0.63	X	0.7	=	75.35	(74)
North	0.9x	0.77	x	1.3	x	74.72	x	0.63	x	0.7	=	29.68	(74)
North	0.9x	0.77	x	3.2	x	79.99	x	0.63	x	0.7	=	78.22	(74)
North	0.9x	0.77	x	1.9	x	79.99	x	0.63	x	0.7	=	46.44	(74)
North	0.9x	0.77	x	4.3	x	79.99	x	0.63	x	0.7	=	105.11	(74)
North	0.9x	0.77	X	4	X	79.99	×	0.63	X	0.7	=	97.78	(74)

North	0.9x	0.77	1 🗸	22	l .	70.00	1 .	0.00	١ ٧	0.7	1 _	00.07	(74)
North	-	0.77	X 	3.3	X I	79.99	l x	0.63	X	0.7] =]	80.67	╡
North	0.9x 0.9x	0.77	X I v	3.3	l x	79.99	l x	0.63	X	0.7	= _	80.67	
North	0.9x	0.77	l X l ,	1.3	l x	79.99	l x	0.63	X	0.7] = _	31.78	$\int_{(74)}^{(74)}$
North	<u> </u>	0.77	X I	3.2	l x l	74.68	l x	0.63	X	0.7] =]	73.03	$\int_{(74)}^{(74)}$
North	0.9x 0.9x	0.77	X I v	1.9	l x	74.68	l x	0.63	X	0.7	= _	43.36	
North	0.9x	0.77	l X l ,	4.3	l x l	74.68	l x	0.63	X	0.7] = _	98.14	$\frac{1}{7}^{(74)}$
North	0.9x	0.77	X	4	X I v	74.68	l x	0.63	X	0.7] = _	91.29	$\int_{(74)}^{(74)}$
North	0.9x	0.77	x x	3.3	x	74.68	l x	0.63	X	0.7	= =	75.31	$\int_{(74)}^{(74)}$
North	0.9x	0.77	^ x	1.3	^ x	74.68 74.68	x x	0.63	X	0.7]	75.31 29.67	
North	0.9x	0.77] ^ x	3.2	^ x	59.25] ^] _x	0.63	X	0.7	- =	57.94	
North	0.9x	0.77	^ x	1.9	^ x	59.25] ^ x	0.63	X	0.7	- =	34.4	
North	0.9x	0.77] ^] _X	4.3	l ^ l x	59.25] ^] _x	0.63	X	0.7		77.86	= (74)
North	0.9x	0.77] ^ x	4.3	^ x	59.25] ^ x	0.63	X	0.7]	72.43	
North	0.9x	0.77	^ x	3.3	l ^	59.25	l ^ l x	0.63	X	0.7		59.75	(74)
North	0.9x	0.77	l x	3.3	l ^	59.25	l ^ l x	0.63	X	0.7	! _	59.75	(74)
North	0.9x	0.77	l x	1.3	X	59.25] ^] _X	0.63	x	0.7	! _	23.54	(74)
North	0.9x	0.77	X	3.2	X	41.52	X	0.63	X	0.7		40.6	(74)
North	0.9x	0.77	l X	1.9	X	41.52	X	0.63	x	0.7	=	24.11	(74)
North	0.9x	0.77	X	4.3	X	41.52	X	0.63	X	0.7	! =	54.56	(74)
North	0.9x	0.77	X	4	X	41.52	x	0.63	x	0.7	 =	50.75	(74)
North	0.9x	0.77	X	3.3	x	41.52	Х	0.63	X	0.7	 =	41.87	(74)
North	0.9x	0.77	X	3.3	x	41.52	X	0.63	x	0.7	=	41.87	(74)
North	0.9x	0.77	X	1.3	х	41.52	x	0.63	x	0.7	=	16.49	(74)
North	0.9x	0.77	x	3.2	х	24.19	x	0.63	x	0.7	=	23.66	(74)
North	0.9x	0.77	×	1.9	x	24.19	x	0.63	x	0.7	j =	14.05	(74)
North	0.9x	0.77	x	4.3	x	24.19	x	0.63	x	0.7	=	31.79	(74)
North	0.9x	0.77	X	4	x	24.19	x	0.63	x	0.7	=	29.57	(74)
North	0.9x	0.77	×	3.3	x	24.19	x	0.63	x	0.7	=	24.4	(74)
North	0.9x	0.77	X	3.3	x	24.19	X	0.63	x	0.7	=	24.4	(74)
North	0.9x	0.77	X	1.3	x	24.19	X	0.63	X	0.7	=	9.61	(74)
North	0.9x	0.77	X	3.2	x	13.12	x	0.63	x	0.7	=	12.83	(74)
North	0.9x	0.77	X	1.9	X	13.12	X	0.63	x	0.7	=	7.62	(74)
North	0.9x	0.77	X	4.3	X	13.12	X	0.63	x	0.7	=	17.24	(74)
North	0.9x	0.77	X	4	x	13.12	X	0.63	x	0.7	=	16.04	(74)
North	0.9x	0.77	x	3.3	x	13.12	x	0.63	x	0.7	=	13.23	(74)
North	0.9x	0.77	x	3.3	x	13.12	x	0.63	X	0.7	=	13.23	(74)
North	0.9x	0.77	X	1.3	x	13.12	x	0.63	X	0.7	=	5.21	(74)
North	0.9x	0.77	x	3.2	x	8.86	x	0.63	X	0.7	=	8.67	(74)
North	0.9x	0.77	X	1.9	x	8.86	x	0.63	X	0.7	=	5.15	(74)
North	0.9x	0.77	X	4.3	X	8.86	X	0.63	X	0.7	=	11.65	(74)

North	0.9x	0.77	X	4		x	8	3.86	x		0.63	x	0.7	=	10.84	(74)
North	0.9x	0.77	х	3.	3	x	8	8.86	x		0.63	х	0.7	=	8.94	(74)
North	0.9x	0.77	x	3.	3	x	8	8.86	x		0.63	x	0.7		8.94	(74)
North	0.9x	0.77	x	1.3	3	x	8	3.86	x		0.63	_ x _	0.7	-	3.52	(74)
	_															
Solar	gains in	watts, ca	alculated	d for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m=	69.22	132.28	224.78	361.05	486.37	52	20.67	486.11	385	.67	270.25	157.46	85.39	57.7		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m ·	+ (8	33)m	, watts		•						
(84)m=	577.22	638.04	713.81	822.84	920	92	27.51	875.75	781	.84	680.59	595.28	554.84	551.34		(84)
7. Me	an inter	nal temp	erature	(heating	season)										
		during h		·			area f	from Tab	ole 9	, Th	1 (°C)				21	(85)
		tor for g				-				,	()					`
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.94	⊢	0.81	0.64	0.7	-	0.94	0.99	1	1		(86)
, ,		1.1		<u> </u>	T4 ((- 1 -	0			. 0 -)		<u> </u>	l		
		l temper						i —				20.27	40.07	40.05		(87)
(87)m=	19.67	19.78	20.01	20.36	20.69		0.91	20.98	20.	96	20.77	20.37	19.97	19.65		(07)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Tr	n2 (°C)				1	
(88)m=	19.98	19.98	19.98	19.99	19.99		20	20	20.	01	20	19.99	19.99	19.99		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	ee Table	9a)							
(89)m=	1	1	1	0.98	0.91	9).72	0.51	0.	6	0.9	0.99	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na	T2 (fc	ollow ste	ns 3	to 7	in Tabl	e 9c)				
(90)m=	18.18	18.35	18.69	19.2	19.67	Ť	9.94	20	19.	$\overline{}$	19.79	19.22	18.63	18.17		(90)
											f	LA = Livin	g area ÷ (4	4) =	0.4	(91)
N 4 a a s	. into we	Lannan	atuma (fa	ماديد محافية	مبيراء ماء	II:	د (د	ΛΤ4	. /4	£I	A) TO					
(92)m=	18.78	temper	19.22	19.66	20.08	_	9) = n 0.33	20.39	+ (1 20.	\neg	20.19	19.68	19.17	18.76]	(92)
` '		nent to the						<u> </u>					10.17	10.70		(02)
(93)m=	18.78	18.93	19.22	19.66	20.08	_	0.33	20.39	20.		20.19	19.68	19.17	18.76		(93)
		iting requ			20.00		.0.00	20.00			20110		10111	10110		
		mean int			re obtair	ned	at ste	ep 11 of	Tabl	e 9h	o, so tha	t Ti.m=(76)m an	d re-calc	culate	
		factor fo		•				о р о.			, 00	•, (. 0,			
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										_		
(94)m=	1	1	0.99	0.98	0.91	(0.75	0.57	0.6	65	0.91	0.99	1	1		(94)
Usefu	ıl gains,	hmGm ,	W = (9	4)m x (8	4)m										-	
(95)m=	576.5	636.56	709.52	803.96	839.67	69	97.69	496.11	508	.14	616.75	588.1	553.49	550.8		(95)
Mont	hly aver	age exte	rnal tem	perature	from Ta	able	e 8								1	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
		e for mea				_				_			i	ı	1	
(97)m=	2002			1463.58			69.67	509.09	533		820.53	1231.98	<u> </u>	1993.95		(97)
•		g require				Nh.				Ť		<u>`</u>			1	
(98)m=	1060.58	872.18	774.21	474.93	221.18		0	0			0	479.05	785.54	1073.71		_
										Total	per year	(kWh/year	r) = Sum(9	8) _{15,912} =	5741.36	(98)
Spac	e heatin	g require	ement in	kWh/m²	?/year										46.87	(99)

9a. Energy requirements – Ind	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heating:		<u> </u>									
Fraction of space heat from s			mentary	system		(224)				0	(201)
Fraction of space heat from m	-				(202) = 1					1	(202)
Fraction of total heating from	•				(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heat	•									93.5	(206)
Efficiency of secondary/suppl	ementar	y heating	g systen	ո, % 		,				0	(208)
Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	year
Space heating requirement (c	alculate	d above)	0	0	0	0	479.05	785.54	1073.71	1	
		ļ	0		1 0		479.03	700.04	1073.71	J	(04.4)
$(211)m = \{[(98)m \times (204)] \} \times 1$ $1134.31 932.81 828.03$	507.94	236.55	0	0	0	0	512.35	840.15	1148.35	1	(211)
1104.01 002.01 020.00	007.04	200.00					ar) =Sum(2			6140.5	(211)
Space heating fuel (secondar	v). kWh/	month					,	7 10,101	_	000	` ′
$= \{[(98)\text{m x } (201)]\} \times 100 \div (201)$	• /									_	
(215)m= 0 0 0	0	0	0	0	0	0	0	0	0		
					Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water heating											
Output from water heater (calc 213.67 188.21 197.38	ulated a 176.55	172.74	153.94	147.46	162.34	162.22	183.09	194.09	208.4		
Efficiency of water heater	170.00		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		192.01			1000		79.8	(216)
(217)m= 88.51 88.4 88.1	87.33	85.47	79.8	79.8	79.8	79.8	87.26	88.16	88.57		(217)
Fuel for water heating, kWh/m	onth										
(219) m = (64) m x $100 \div (217)$		202.00	100.01	404.70	1 202 42	202.00	1 200 00	220.40	1 005 00	1	
(219)m= 241.41 212.92 224.05	202.18	202.09	192.91	184.79	203.43 Tota	203.28 I = Sum(2	209.82 19a) =	220.16	235.29	2532.33	(219)
Annual totals								Wh/yeaı	r	kWh/ye	
Space heating fuel used, main	system	1					•••	, y ou.	•	6140.5	<u></u>
Water heating fuel used										2532.33	Ħ
Electricity for pumps, fans and	electric	keep-ho	t								
central heating pump:	0.000		-						30	1	(2300
] 1	
boiler with a fan-assisted flue									45		(2306
Total electricity for the above, I	kWh/yea	ır			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										454.09	(232)
12a. CO2 emissions – Individ	ual heat	ing syste	ms incl	uding mi	icro-CHF						
				e rgy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emission kg CO2/y	_
				4.					_	4000.05	(261)
Space heating (main system 1)		(21)	1) x			0.2	16	=	1326.35	[(201)
)			1) x 5) x					=		
Space heating (secondary))		(21	5) x			0.5	19	=	0	(263)
Space heating (main system 1 Space heating (secondary) Water heating Space and water heating)		(21)	5) x 9) x	+ (263) + ((264) –		19			

Electricity for pumps, fans and electric keep-hot (267)0.519 38.93 Electricity for lighting (232) x (268) 0.519 235.67 Total CO2, kg/year sum of (265)...(271) = (272) 2147.93

(231) x

TER =

(273)

17.53

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP			Stroma Softwa	re Ve	rsion:		Versio	on: 1.0.4.26	
.		Р	roperty.	Address:	A08_B	e Lean				
Address: 1. Overall dwelling dime	ansions:									
1. Overall dwelling diffle	#11310F13.		Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m	3)
Ground floor			7		(1a) x		2.8	(2a) =	109.2) (3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d))+(1e)+(1r	n)		(4)			J		
Dwelling volume	۵,۰(۰۵,۰(۰۵,۰	, . (. •)(.,	55)+(3c)+(3c	d)+(3e)+	(3n) =	100.2	— (5)
					(00) (00	,, (33) (33	2) * (00) *	(0)	109.2	(5)
2. Ventilation rate:	main	secondar	у	other		total			m³ per hou	ır
Number of chimneys	heating	heating	┐ + ┌		1 = Г		x	40 =	_	(6a)
,			╛╘	0]	0			0	= ` `
Number of open flues	U	+ 0	_] +	0] = [0		20 =	0	(6b)
Number of intermittent fa	ins					0	X	10 =	0	(7a)
Number of passive vents						0	X	10 =	0	(7b)
Number of flueless gas fi	res					0	X ·	40 =	0	(7c)
					_			4		
					_		<u> </u>	Air cr	nanges per h	our —
Infiltration due to chimne						0		÷ (5) =	0	(8)
If a pressurisation test has b Number of storeys in the		ntended, procee	d to (17), (otnerwise d	ontinue fr	rom (9) to	(16)		0	(9)
Additional infiltration	no awoming (no)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or tim	nber frame or	0.35 fo	r masonr	y consti	ruction			0	(11)
if both types of wall are p			the great	er wall are	a (after					
deducting areas of openii If suspended wooden t	• / .		1 (spale	معام (امد	enter ()				0	(12)
If no draught lobby, en	,	•	. i (Scaic	, cisc	criter o				0	(13)
Percentage of windows	•								0	(14)
Window infiltration		,		0.25 - [0.2	x (14) ÷ 1	100] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in	n cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	3	(17)
f based on air permeabil	ity value, then (18	$) = [(17) \div 20] + (3)$	8), otherw	ise (18) = (16)				0.15	(18)
Air permeability value applie		est has been dor	ne or a de	gree air pei	meability	is being u	sed			_
Number of sides sheltere Shelter factor	ed			(20) = 1 -	n 075 x (*	19\1 –			2	(19)
Infiltration rate incorporat	ting shelter factor			(21) = (18)		10)] =			0.85	(20)
Infiltration rate modified f		need		,=·/ (10)	. (=0) =				0.13	(21)
Jan Feb	 	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp			L 54.	<u>, ,,,,</u>	<u> </u>	1 000	1	1 200	J	
$\frac{\text{(22)m}= \begin{array}{ c c c }\hline 5.1 & 5 \\ \hline \end{array}$	1	1.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
, , , , , , , , , , , , , , , , , , , ,	· · · ·		I		-		<u> </u>	<u> </u>	J	
Wind Factor (22a)m = (2	2)m ÷ 4								,	
(22a)m= 1.27 1.25	1.23 1.1 1.	.08 0.95	0.95	0.92	1	1.08	1.12	1.18	Ī	

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
alculate effec		•	rate for t	he appli	cable ca	se							
If mechanica			l' N. (6	OL) (OO	\ - /	/	15// (1	. (201) (00)			0.5	(2
If exhaust air he) = (23a)			0.5	(2
If balanced with		-	•	_								76.5	(2
a) If balance					1	- ` ` 	- ^ ` ` - 	```	 	- 	· ` `) ÷ 100] 1	(0
a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27]	(2
b) If balance					1	· · · · ·	<u> </u>	í È	<u> </u>		1	1	
b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h				•	•				F (00)	,			
if (22b)n		<u> </u>		ŕ	<u>, </u>	· ` `	ŕ	ŕ	<u> </u>		Ι .	1	()
c)m= 0	0	0		0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n				•	•				0.5]				
d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change	rate - er	nter (24a) or (24h	o) or (24	c) or (24	d) in box	(25)			•	-	
)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
Heet lesses	and be	ot loss i	o romot	0.51								_	-
. Heat losse	Gros		Openin		Net Ar	200	U-valı	10	AXU		k-valu	0	AXk
<u>EME</u> NT	area		Operiin		A ,r		W/m2		(W/ł	<)	kJ/m ² ·		kJ/K
o <mark>rs Ty</mark> pe 1					2.5	x	1.3	= [3.25				(2
ors Type 2					2.5	X	1	= -	2.5	Ħ			(2
ndows Type	1				1.3	x1,	/[1/(1.3)+	0.04] =	1.61	Ħ			(2
ndows Type					2.5	-	/[1/(1.3)+	0.041 =	3.09	4			(2
ndows Type					4.1		· /[1/(1.3)+	Ļ	5.07	╡			(2
alls		, <u>,</u>	12.0			=	- ` '			╡ ,			(2
	31.9		12.9		19.02	=	0.15	=	2.85				
tal area of e			effo otivo vvi	ndow II w	31.92		formula 1	/[/1/	· 0 0 0 41 o	a siran in	no roor ron	h 2 2	(3
or windows and nclude the area						ateu usirig	TOTTIUIA T	/[(e)+0.04j a	is giveri iri	paragrapi	1 3.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				18.37	(3
at capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
ermal mass	parame	ter (TMF	c = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Medium		250	(3
design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste													
ermal bridge	•	,		•	•	<						1.6	(3
etails of therma tal fabric he		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	(36) =			=	
		alouloto -	l manthi							25\m v (5)		19.97	(3
ntilation hea		1			1	1, .1	Λ		= 0.33 × (i	1	
Jan 10.00	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(3
)m= 10.09	9.98	9.86	9.29	9.17	8.6	8.6	8.48	8.83	9.17	9.4	9.63	J	(-
at transfer o	oefficier	nt, W/K	ı					(39)m	= (37) + (3	38)m		7	

Heat loss par	rameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.77	0.77	0.76	0.75	0.75	0.73	0.73	0.73	0.74	0.75	0.75	0.76		
	I		<u>l</u>		<u> </u>	ļ	ļ	'	Average =	Sum(40) ₁	12 /12=	0.75	(40)
Number of da	ays in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water he	ating ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occ if TFA > 13 if TFA £ 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		38		(42)
Annual avera Reduce the ann not more that 12	ual average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.98		(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 = fa	ctor from	Table 1c x	(43)	!		•			
(44)m= 73.67	70.99	68.31	65.64	62.96	60.28	60.28	62.96	65.64	68.31	70.99	73.67		
		•				•				m(44) ₁₁₂ =		803.71	(44)
Energy content	of hot water	used - ca	culated m	onthly = 4 .	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 109.25	95.56	98.6	85.97	82.49	71.18	65.96	75.69	76.59	89.26	97.43	105.81		_
If instantaneous	water heati	ing at noin	of use (no	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =		1053.78	(45)
	_			-		_			42.20	44.00	45.07		(46)
(46)m= 16.39 Water storag		14.79	12.89	12.37	10.68	9.89	11.35	11.49	13.39	14.62	15.87		(40)
Storage volu) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if	•			•			` '	ers) ente	er '0' in ((47)			
Water storag													
a) If manufa				or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost for		•					(48) x (49)) =		1	10		(50)
b) If manufade Hot water sto			-								02		(51)
If community	•			C 2 (KVV)	11/11(10/00	·y <i>)</i>				0.	02		(51)
Volume facto	•									1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost for	rom wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	r (54) in (55)								1.	03		(55)
Water storag	e loss cal	lculated	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain		ed solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circu	iit loss (ar	nnual) fr	m Table	3				•			0		(58)
Primary circu	•	,			59)m = ((58) ÷ 36	65 × (41)	m			-		` '
(modified b				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0 0	0	0	0	00) +	000 x (41	0	0	T 0	T 0	0	1	(61)
		<u> </u>] · (59)m + (61)m	(0.)
(62)m= 164.5	-i	153.88	139.46	137.76	124.67		130.9		` 	` 	161.08	(39)III + (61)III]	(62)
` '		<u> </u>										J	(02)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	l water hea	L ter					<u> </u>		<u> </u>		Ļ	J	
(64)m= 164.5		153.88	139.46	137.76	124.67	121.23	130.9	6 130.09	144.54	150.93	161.08]	
	Į	<u> </u>					C	utput from v	vater heat	 er (annual) ₁	112	1704.62	(64)
Heat gains f	rom water	heating.	kWh/m	onth 0.2	8.01 ` 5	5 × (45)m	n + (61)ml + 0.8	x [(46)n	n + (57)m	+ (59)m	1	_
(65)m= 80.5		77.01	71.38	71.65	66.46	66.15	69.3	 	73.9	75.19	79.4	اُ	(65)
include (5	7)m in cal	culation o	of (65)m	only if c	vlinder	is in the	dwellir	na or hot v	vater is	from com	munity h	ı neating	
5. Internal					,						- 7	3	
Metabolic ga				, -									
Jar		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 69	69	69	69	69	69	69	69	69	69	69	69		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso se	e Table 5					
(67)m= 10.62	$\overline{}$	7.67	5.81	4.34	3.67	3.96	5.15		8.78	10.24	10.92		(67)
Appliances of	gains (calc	ulated ir	Append	dix L, eq	uation	_13 or L1	3a), a	lso see Ta	able 5			•	
(68)m= 119.0	3 120.26	117.15	110.52	102.16	94.3	89.05	87.8	1 90.92	97.55	105.91	113.78]	(68)
Cooking gai	ns (calcula	ited in A	ppendix	L, equat	ion L1	or L15a), also	see Tabl	e 5			•	
(69)m= 29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9		(69)
Pumps and	fans gains	(Table 5	ōa)							•			
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)					•		•	
(71)m= -55.2	2 -55.2	-55.2	-55.2	-55.2	-55.2	-55.2	-55.2	2 -55.2	-55.2	-55.2	-55.2]	(71)
Water heatir	ng gains (T	able 5)				•			•	•		•	
(72)m= 108.2	106.72	103.5	99.14	96.3	92.31	88.91	93.2	6 94.81	99.33	104.43	106.72]	(72)
Total intern	al gains =				(6	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 281.6	2 280.12	272.03	259.17	246.5	233.97	225.62	229.9	236.34	249.35	264.29	275.12]	(73)
6. Solar ga	ins:							•					
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to t	he applica	able orienta	tion.		
Orientation:			Area			ux		g_ Table Ch		FF		Gains	
	Table 6d		m²		- 1	able 6a	, –	Table 6b) — -	Table 6c		(W)	_
East 0.9	× 0.3	Х	2.	5	х	19.64	x	0.53	x	0.82	=	5.76	(76)
East 0.9		X	4.	1	x	19.64	X	0.53	х	0.7	=	8.07	(76)
East 0.9	× 0.3	X	2.	5	x	38.42	X	0.53	x	0.82	=	11.27	(76)
East 0.9	× 0.3	X	4.	1	x	38.42	x	0.53	х	0.7	=	15.78	(76)
East 0.9	× 0.3	X	2.	5	x	63.27	x	0.53	×	0.82	=	18.56	(76)

East	ر م مدر آ								1				_		(70)
	0.9x	0.3		X	4.1	⊣ ′		33.27] X]	0.53	×	0.7	_ =	25.99	(76)
East	0.9x	0.3		X	2.5		-	92.28	X	0.53	×	0.82	╡ -	27.07	(76)
East	0.9x	0.3		X	4.1			92.28] X	0.53	×	0.7	╡ -	37.9	(76)
East	0.9x	0.3		X	2.5	⊣ '		13.09	X	0.53	×	0.82	=	33.18	(76)
East -	0.9x	0.3		X	4.1	×	1	13.09	X	0.53	Х	0.7	=	46.45	(76)
East	0.9x	0.3		X	2.5	×	1	15.77	X	0.53	X	0.82	=	33.96	(76)
East	0.9x	0.3		X	4.1	×	1	15.77	Х	0.53	X	0.7	=	47.55	(76)
East	0.9x	0.3		X	2.5	×	1	10.22	X	0.53	X	0.82	=	32.33	(76)
East	0.9x	0.3		X	4.1	×	1	10.22	X	0.53	X	0.7	=	45.27	(76)
East	0.9x	0.3		X	2.5	Х		94.68	X	0.53	X	0.82	=	27.77	(76)
East	0.9x	0.3		X	4.1	х		94.68	X	0.53	Х	0.7	=	38.88	(76)
East	0.9x	0.3		x	2.5	х	: <u>-</u>	73.59	X	0.53	X	0.82	=	21.59	(76)
East	0.9x	0.3		x	4.1	×	: -	73.59	x	0.53	х	0.7	=	30.22	(76)
East	0.9x	0.3		x	2.5	×	. 4	15.59	x	0.53	x	0.82	=	13.37	(76)
East	0.9x	0.3		x	4.1	x	:	15.59	x	0.53	x	0.7		18.72	(76)
East	0.9x	0.3		x	2.5	×		24.49	x	0.53	x	0.82		7.18	(76)
East	0.9x	0.3		x	4.1	×		24.49	x	0.53	x	0.7		10.06	(76)
East	0.9x	0.3		x	2.5	—		16.15	Х	0.53	X	0.82		4.74	(76)
East	0.9x	0.3		x	4.1	= ×		16.15	X	0.53	x	0.7	= -	6.63	(76)
West	0.9x	0.77		x	1.3	×		19.64	i x	0.53	X	0.7		6.56	(80)
West	0.9x	0.77		x	1.3			38.42	X	0.53	X	0.7	_	12.84	(80)
West	0.9x	0.77		x	1.3	,		63.27	Х	0.53	X	0.7	_	21.15	(80)
West	0.9x	0.77		x	1.3	\dashv \downarrow	\	92.28) X	0.53	x	0.7	= =	30.84	(80)
West	0.9x	0.77		x	1.3			13.09]] _X	0.53	X	0.7	= =	37.8	(80)
West	0.9x	0.77		x	1.3	=		15.77]]	0.53	x	0.7	= =	38.69	(80)
West	0.9x	0.77		x	1.3	\dashv ,	-	10.22]]	0.53	x	0.7	= =	36.84	(80)
West	0.9x	0.77		X	1.3		_	94.68] x	0.53	×	0.7	= =	31.64	(80)
West	0.9x	0.77		X	1.3		-	73.59] x	0.53	×	0.7	= =	24.6	(80)
West	0.9x	0.77		X	1.3	=	-	15.59] ^] x	0.53	= x	0.7	= -	15.24	(80)
West	0.9x			X		\dashv ,] ^] x		$=$ $\frac{1}{x}$		- -		(80)
West	0.9x	0.77			1.3	=	<u> </u>	24.49	1	0.53	=	0.7	=	8.19	(80)
WOSt	0.9X	0.77		X	1.3	x		16.15	X	0.53	X	0.7	=	5.4	(80)
Solor	oino in	wotto or	doulo	tod	for each m	onth			(02\m	- Cum(74)m	(92)m				
(83)m=	20.39	39.89	65.	\neg		7.42	120.2	114.44	98	1 = Sum(74)m $1 = 3m$ $1 =$	47.33		16.77	1	(83)
` '					(84)m = (7)			<u> </u>		1	1]	, ,
Ţ	302.01	320.01	337.	_	` 	3.93	354.18	340.06	328	.22 312.75	296.6	9 289.72	291.89	1	(84)
L	on inter	nal tamp	oroti	ıro /						<u> </u>					
				•	heating sea		a oroo	from Tol	olo O	Th1 (°C)				04	(85)
•		_		•	eriods in the		_		JIE 9	, IIII (C)				21	(65)
Utilisa		Feb		-	ving area, l		`	Jul	Ι	ug Sep	Oc	t Nov	Doo	1	
(86)m=	Jan 0.99	0.98	0.96	$\boldsymbol{ o}$		May .72	Jun 0.51	0.37	0.4		0.89	_	0.99	1	(86)
· · L		ļ			ļ			ļ	<u> </u>	<u> </u>	1 0.09	0.97	0.99	J	(00)
Г				-	ving area	$\overline{}$		i –	1		1 00 0	00.07	00.10	1	(07)
(87)m=	20.47	20.56	20.7	2	20.89 20).98	21	21	2	1 20.99	20.9	20.67	20.46]	(87)

Temn	aratura	during h	neating p	ariade ir	rest of	dwelling	from Ta	hla 0 T	h2 (°C)					
(88)m=	20.28	20.28	20.28	20.3	20.3	20.31	20.31	20.31	20.31	20.3	20.29	20.29		(88)
. ,		ļ.	ains for					<u> </u>						,
(89)m=	0.99	0.98	0.94	0.85	0.67	0.46	0.31	0.34	0.57	0.86	0.97	0.99		(89)
Mean	interna	l tempei	rature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 1	7 in Tabl	e 9c)				
(90)m=	19.59	19.72	19.93	20.17	20.28	20.31	20.31	20.31	20.3	20.19	19.88	19.58		(90)
		•	•						f	LA = Livin	g area ÷ (4	1) =	0.54	(91)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 − fLA) × T2														
(92)m=	20.06	20.17	20.35	20.56	20.65	20.68	20.68	20.68	20.67	20.57	20.31	20.05		(92)
Apply	adjustr	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate	•			
(93)m=	20.06	20.17	20.35	20.56	20.65	20.68	20.68	20.68	20.67	20.57	20.31	20.05		(93)
			uirement											
			ternal ter or gains	•		ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
tilo di	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm		,				'	<u> </u>				
(94)m=	0.98	0.97	0.95	0.86	0.7	0.49	0.34	0.37	0.6	0.87	0.97	0.99		(94)
Us <mark>ef</mark> u	ıl gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m=	297.21	311.72	319.2	305.04	253.66	173.17	116.53	121.76	187.27	257.67	279.67	288.01		(95)
		T	ernal tem											(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
(97)m=	473.77	457.28	an intern 413.2	341.01	260.86	Lm , vv =	116.56	x [(93)m 121.82	- (96)m 189.24	290.47	387.86	469.12		(97)
			ement fo									400.12		(01)
(98)m=	131.36	97.81	69.93	25.9	5.35	0	0	0	0	24.4	77.89	134.75		
` '								I Tota	l per year	l (kWh/year) = Sum(9	8) _{15,912} =	567.4	(98)
Space	e heatin	g requir	ement in	kWh/m²	?/year						,	, I	14.55	(99)
9b. En	ergy red	quireme	nts – Cor	nmunity	heating	scheme						L		
This pa	art is us	ed for sp	oace hea	ting, spa	ace cooli	ng or wa	ater heat				unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary	/supplem	nentary I	neating (Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
	-		y obtain he s, geotherr							up to four	other heat	sources; th	ne latter	
			s <i>, geomen</i> Commun			rom powei	stations.	see Appei	riaix C.			[1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem		Ī	1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for o	communi	ity heatii	ng syste	m				Ī	1.05	(306)
Space	heatin	g											kWh/ye	ear_
Annua	l space	heating	requiren	nent									567.4	
Space	heat fro	om Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [595.77	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[0	(308

Space heating requirement from secondary/supplementary	system (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1704.62	7
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	1789.86	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	23.86	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not ente	$= (107) \div (314)$	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	from outside		101.58	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330h	o) + (330g) =	101.58	(331)
Energy for lighting (calculated in Appendix L)			187.63	(332)
12b. CO2 Emissions – Community heating scheme				
12b. CO2 Emissions – Community heating scheme	Energy	Emission factor		
12b. CO2 Emissions – Community heating scheme	Energy kWh/year		Emissions kg CO2/year	
CO2 from other sources of space and water heating (not C	kWh/year	kg CO2/kWh	kg CO2/year	(367a)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) If there is CHF	kWh/year HP)	kg CO2/kWh	kg CO2/year	(367a) (367)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) If there is CHF	kWh/year HP) Pusing two fuels repeat (363) to	kg CO2/kWh (366) for the second fue	90 572.55	⊣ ` `
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(3)	kWh/year HP) P using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x	(366) for the second fue 0.22 = 0.52 =	90 572.55 12.38	(367)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(3) Electrical energy for heat distribution	kWh/year HP) P using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x	(366) for the second fue 0.22 = 0.52 =	90 572.55 12.38 584.93	(367)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(3) Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year HP) P using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372)	(366) for the second fue 0.22 = 0.52 = 0.52	90 572.55 12.38 584.93	(367) (372) (373)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year HP) P using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372)	(366) for the second fue 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52	90 572.55 12.38 584.93	(367) (372) (373) (374)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instar	kWh/year HP) P using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x ntaneous heater (312) x (373) + (374) + (375) =	(366) for the second fue 0.22 = 0.52 = 0.52 = 0.52	90 572.55 12.38 584.93 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instart Total CO2 associated with space and water heating	kWh/year HP) P using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x ntaneous heater (312) x (373) + (374) + (375) =	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 = 0.22 = 0.52 = 0 = 0.22 = 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	90 572.55 12.38 584.93 0 0 584.93 52.72	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instart Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within the control of	kWh/year HP) Pusing two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x ntaneous heater (312) x (373) + (374) + (375) = lwelling (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	90 572.55 12.38 584.93 0 0 584.93 52.72	(367) (372) (373) (374) (375) (376) (378)

El rating (section 14)

(385)

		Use <u>r</u> l	Details:				
Assessor Name: Software Name:	Stroma FSAP 2012	Droportu	Stroma N Software Address: A0	Version:	Versio	n: 1.0.4.26	
Address :		Property	Address. Au	o_be Lean			
1. Overall dwelling dime	nsions:						
		Are	ea(m²)	Av. Hei		Volume(m ³	<u> </u>
Ground floor			39 (1a)	X 2.	8 (2a) =	109.2	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+.	(1n)	39 (4)				
Dwelling volume			(3a))+(3b)+(3c)+(3d)	+(3e)+(3n) =	109.2	(5)
2. Ventilation rate:							
	main secon heating hear	ndary ting	other	total		m³ per hou	ır
Number of chimneys	0 +	0 +	0	= 0	x 40 =	0	(6a)
Number of open flues	0 +	0 +	0	= 0	x 20 =	0	(6b)
Number of intermittent fa	ns			2	x 10 =	20	(7a)
Number of passive vents				0	x 10 =	0	(7b)
Number of flueless gas fi				0	x 40 =	0	(7c)
Infiltration due to chimner		(6b)+(7a)+(7b)+	·(7c) =	20	Air ch	anges per ho	
	een carried out or is intended, p					0.18	(0)
Number of storeys in the	ne dw <mark>elling</mark> (ns)					0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
	.25 for steel or timber fram		•			0	(11)
deducting areas of openir	resent, use the value correspon ngs); if equal user 0.35	aing to the grea	ater wall area (an	ter			
If suspended wooden f	loor, enter 0.2 (unsealed)	or 0.1 (seal	ed), else ente	er 0		0	(12)
If no draught lobby, en	ter 0.05, else enter 0					0	(13)
-	s and doors draught stripp	ped				0	(14)
Window infiltration			0.25 - [0.2 x (1/4) + (4.4)		(45)	0	(15)
Infiltration rate	aEO avaraged in aubic r	matraa nar b		1) + (12) + (13) +		0	(16)
If based on air permeabil	q50, expressed in cubic r	-		re metre of er	ivelope area	5	(17)
·	s if a pressurisation test has be			ability is being us	ed	0.43	(18)
Number of sides sheltere	•			, ,		2	(19)
Shelter factor			(20) = 1 - [0.07	75 x (19)] =		0.85	(20)
Infiltration rate incorporat	ing shelter factor		$(21) = (18) \times (2$	20) =		0.37	(21)
Infiltration rate modified f	or monthly wind speed					1	
Jan Feb	Mar Apr May	Jun Jul	Aug S	Sep Oct	Nov Dec		
Monthly average wind sp	eed from Table 7		, ,		· · · · · · · · · · · · · · · · · · ·	ı	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4 4.3	4.5 4.7		
Wind Factor (22a)m = (22	2)m ÷ 4						
	' 	0.95	0.92	1 1.08	1.12 1.18		
					ı	l	

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43		
alculate effec		-	rate for t	he appli	cable ca	se		!				-	
If mechanical If exhaust air he			andiv N (2	3h) - (23s	a) v Emy (e	aguation (N	VSV) othe	rwice (23h) <i>- (</i> 23a)			0	(2
If balanced with) = (23a)			0	(2
		-	-	_					01- \ <i>(</i>	001-) [4 (00 =	0	(2
a) If balance	a mecna 0	anicai ve	ntilation	with ne	at recove	ery (IVIVI	1R) (248	$\frac{1}{10} = \frac{22}{10}$	2b)m + (.	23b) × [*	1 – (23C) ÷ 100]]	(2
												_	(2
b) If balance	a mecha 0	anicai ve	niliation 0	without	neat red		0 (240	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	2D)m + (2 0	230)	0	1	(2
									0	0		_	(2
c) If whole h if (22b)n				•	•				5 x (23h)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural	ventilatio	n or wh	ole hous	L nositiv	ve input	L ventilatio	n from I	oft.			<u>!</u>	_	
if (22b)n				•					0.5]				
4d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(2
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	x (25)		-	-	_	
5)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(2
B. Heat losse	and he	at lose	naram a t	or.								_	
LEMENT	Gros		Openin		Net Ar	A2	U-val	ue.	AXU		k-valu	<u> </u>	ΑΧk
	area		m		A ,r		W/m2		(W/I	<)	kJ/m ² ·		kJ/K
oo <mark>rs Type 1</mark>					2.5	x	1.2	= [3				(:
oors Type 2					2.5	x	1.2	=	3	П			(2
indows Type	1				0.78	x1.	/[1/(1.4)+	0.04] =	1.03	П			(2
indows Type	2				1.5	x1.	/[1/(1.4)+	0.04] =	1.99	5			(2
indows Type	3				2.47	x1.	/[1/(1.4)+	0.04] =	3.27	=			(:
alls	31.9	92	9.75		22.17	, x	0.18	<u>_</u>	3.99	=		\neg \vdash	(2
otal area of e					31.92	=							^` (;
or windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	e)+0.041 a	ns aiven in	paragrap	h 3.2	· ·
nclude the area						· ·			,	J	, , ,		
bric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				16.2	9 (:
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(;
r design assess				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
n be used inste				icina Ar	nondiy l	/							
nermal bridge Hetails of therma	•	,		• .	•	`						1.6	(
otal fabric he		are not kir	OWII (30) -	- 0.00 X (3	''')			(33) +	(36) =			17.8	9 (
entilation hea		alculated	l monthly	/					= 0.33 × (25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
	21.83	21.68	20.97	20.84	20.22	20.22	20.11	20.46	20.84	21.11	21.39	1	(;
3)m= 21.99						i	i	I .	I .	I	1	1	
eat transfer o	nefficier	ι nt \Λ//k			•	-		(30)m	= (37) + (3	38)m	-	-	

eat lo	ss para	meter (H	ILP), W/	m²K			•		(40)m	= (39)m ÷	(4)			
0)m=	1.02	1.02	1.01	1	0.99	0.98	0.98	0.97	0.98	0.99	1	1.01		
umba	r of dov	a in man	sth /Tabl	0.10)					1	Average =	Sum(40) ₁ .	.12 /12=	1	(4
Г	Jan	Feb	nth (Tabl Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	Apr 30	31	30	31	31	30 30	31	30	31		(4
., L			<u> </u>		0.			<u> </u>	00			<u> </u>		•
4. Wat	ter heat	ing ener	gy requi	rement:								kWh/yea	r:	
oou ma	ad agai	nanay N	.I											
if TF				[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)	38		(4
								(25 x N) to achieve		se target o		.98		(4
		-	person per			-	-	o domovo	a water ac	oc larger o	•			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate	r usage ir	litres per	day for ea	ch month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m=	73.67	70.99	68.31	65.64	62.96	60.28	60.28	62.96	65.64	68.31	70.99	73.67		
erav c	ontent of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd.r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		803.71	(4
Г.	109.25	95.56	98.6	85.97	82.49	71.18	65.96	75.69	76.59	89.26	97.43	105.81		
7 L	100.20	55.55	00.0	00.01	02.10	11.10	00.00	70.00			m(45) ₁₁₂ =		1053.78	(₍
nstanta	aneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)			()2			`
	16.39	14.33	14.79	12.89	12.37	10.68	9.89	11.35	11.49	13.39	14.62	15.87		(-
	storage		ingludin	a on (o	dor or M	MUDC	otorogo	within or		ool				,
		,	nd no ta					within sa	arrie ves	Sei		150		(4
	-	_			_			mbi boil	ers) ente	er '0' in (47)			
ater s	storage	loss:		`					,	`	,			
) If ma	anufactı	urer's de	eclared lo	oss facto	or is kno	wn (kWł	n/day):				1.	39		(-
emper	rature fa	actor fro	m Table	2b							0.	54		(4
			storage	-		:		(48) x (49)) =		0.	75		(
,			eclared of factor fr	•)		(!
		-	ee sectio		`		,							`
		rom Tal)		(
empei	rature fa	actor fro	m Table	2b)		(
•			storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(
•	. , .	54) in (5	•								0.	75		(
ater s		loss cal	culated f	or each	month		T	((56)m = (55) × (41)ı	m ·				
i)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		(
Г							· · · · ·					m Appendix	11	,,
7)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		(!
		,	nual) fro	m Table	3)		(!
-														
imary			culated f		,	•	. ,	65 × (41) ng and a		r thorms	ctat)			

Combi loss c	alculated	for each	month ((61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0	0	0	0	0	0	00 % (11)	0		0	0	0	0]	(61)
	quired for	water he	eating ca	alculated	L for eac	h month	(62)n	n = 0.8	85 × (45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 155.85	`	145.2	131.06	129.08	116.27	112.55	122.2	_	21.68	135.86	142.53	152.4		(62)
Solar DHW input	t calculated	using App	endix G or	· Appendix	H (negat	ive quantity	y) (ente	r '0' if n	no solar	contribut	tion to wate	r heating)	l	
(add addition												σ,		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output from v	water hea	ter					•	•	•		•		•	
(64)m= 155.85	137.64	145.2	131.06	129.08	116.27	112.55	122.2	28 12	21.68	135.86	142.53	152.4]	
	•					•		Output f	rom wa	ater heate	r (annual) ₁	12	1602.4	(64)
Heat gains fro	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (6′	I)m] +	0.8 x	[(46)m	+ (57)m	+ (59)m]	
(65)m= 73.6	65.44	70.06	64.66	64.7	59.74	59.21	62.4	4 6	1.54	66.95	68.47	72.46		(65)
include (57)m in calc	culation of	of (65)m	only if c	ylinder i	s in the	dwelli	ng or	hot wa	ater is f	rom com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a):										
Metabolic gai	ins (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g	Sep	Oct	Nov	Dec		
(66)m= 69	69	69	69	69	69	69	69		69	69	69	69		(66)
Ligh <mark>ting g</mark> ains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Tab	ole 5					
(67)m= 11.15	9.9	8.05	6.1	4.56	3.85	4.16	5.4	7	7.25	9.21	10.75	11.46		(67)
App <mark>liance</mark> s g	ains (ca <mark>lc</mark>	ulated in	Append	dix L, eq	uation L	.13 or L1	3 a), a	lso se	e Tal	ole 5				
(68)m= 119.03	3 120.26	117.15	110.52	102.16	94.3	89.05	87.8	1 9	0.92	97.55	105.91	113.78		(68)
Cooking gain	s (calcula	ted in A	pendix	L, equat	ion L15	or L15a)), also	see	Table	5				
(69)m= 29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9) 2	29.9	29.9	29.9	29.9		(69)
Pumps and fa	ans gains	(Table 5	<u></u> ба)					Ì	•					
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)	-					-	-		
(71)m= -55.2	-55.2	-55.2	-55.2	-55.2	-55.2	-55.2	-55.	2 -	55.2	-55.2	-55.2	-55.2		(71)
Water heating	g gains (T	able 5)											•	
(72)m= 98.93	97.38	94.17	89.8	86.97	82.97	79.58	83.9	3 8	5.47	89.99	95.1	97.39		(72)
Total interna	ıl gains =				(66)m + (67)m	n + (68)	m + (69	9)m + (70)m + (7	71)m + (72)	m	•	
(73)m= 275.8	274.24	266.07	253.12	240.38	227.82	219.48	223.8	34 23	30.35	243.45	258.46	269.32		(73)
6. Solar gair	ns:													
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	ations to	conve	ert to the	e applicat		ion.		
Orientation:			Area m²		Flu	ıx ble 6a		g_ Tob	_ le 6b	_	FF able 6c		Gains	
_	Table 6d				Га	Die ba		rabi	ie ob	, ,	able oc		(W)	,
East 0.9x		Х	1.5	5	X	19.64] x [0.	.63	x	0.7	=	3.51	(76)
East 0.9x		X	2.4	7	X ·	19.64] x [0.	.63	x	0.7	=	5.78	(76)
East 0.9x		X	1.5	5	x ;	38.42] x [0.	.63	x	0.7	=	6.86	(76)
East 0.9x		Х	2.4	7	x :	38.42] x [0.	.63	x	0.7	=	11.3	(76)
East 0.9x	0.3	X	1.5	5	x (63.27	x	0.	.63	X	0.7	=	11.3	(76)

East	о о . Г					_			1				_		7(70)
	0.9x	0.3		X	2.47	×		63.27] X]	0.63	×	0.7	_ =	18.61	(76)
East	0.9x	0.3		X	1.5	ᆗ [×]	—	92.28] X]	0.63	×	0.7	╡ "	16.48	(76)
East	0.9x	0.3		X	2.47	→ ×		92.28	J X 1	0.63	×	0.7	╡ -	27.14	(76)
East	0.9x	0.3		X	1.5	→ ×		13.09	X	0.63	×	0.7	=	20.2	(76)
East	0.9x	0.3		X	2.47	×	1	13.09	X	0.63	X	0.7	=	33.26	(76)
East	0.9x	0.3		X	1.5	×	1	15.77	X	0.63	X	0.7	=	20.68	(76)
East	0.9x	0.3		X	2.47	X	1	15.77	X	0.63	X	0.7	=	34.05	(76)
East	0.9x	0.3		X	1.5	×	1	10.22	X	0.63	X	0.7	=	19.69	(76)
East	0.9x	0.3		X	2.47	X	1	10.22	X	0.63	X	0.7	=	32.42	(76)
East	0.9x	0.3		X	1.5	x	,	94.68	X	0.63	X	0.7	=	16.91	(76)
East	0.9x	0.3		X	2.47	X	9	94.68	X	0.63	X	0.7	=	27.84	(76)
East	0.9x	0.3		X	1.5	x	-	73.59	X	0.63	X	0.7	=	13.14	(76)
East	0.9x	0.3		X	2.47	×		73.59	X	0.63	x	0.7	=	21.64	(76)
East	0.9x	0.3		X	1.5	x		45.59	x	0.63	x	0.7	_ =	8.14	(76)
East	0.9x	0.3		X	2.47	x	-	45.59	x	0.63	x	0.7	=	13.41	(76)
East	0.9x	0.3		X	1.5	×		24.49	x	0.63	x	0.7		4.37	(76)
East	0.9x	0.3		X	2.47	x		24.49	X	0.63	x	0.7	_ =	7.2	(76)
East	0.9x	0.3		X	1.5	×		16.15	Х	0.63	Х	0.7		2.88	(76)
East	0.9x	0.3		X	2.47	₹ ×		16.15	X	0.63	X	0.7	= -	4.75	(76)
West	0.9x	0.77		X	0.78	×		19.64	i 🙏	0.63	X	0.7		4.68	(80)
West	0.9x	0.77		X	0.78		/—	38.42	X	0.63	X	0.7	=	9.16	(80)
West	0.9x	0.77		X	0.78	×		63.27	X	0.63	X	0.7	_	15.08	(80)
West	0.9x	0.77	7	X	0.78	\dashv $_{x}$	<u> </u>	92.28	X	0.63	X	0.7	= =	22	(80)
West	0.9x	0.77		X	0.78	×		13.09]]	0.63	X	0.7	= =	26.96	(80)
West	0.9x	0.77		X	0.78	=\ x		15.77	」] x	0.63	x	0.7	= =	27.6	(80)
West	0.9x	0.77		X	0.78	x	-	10.22] x	0.63	X	0.7	= =	26.27	(80)
West	0.9x	0.77		x	0.78	^_ x	_	94.68] ^] x	0.63	×	0.7	_ =	22.57	(80)
West	0.9x	0.77		x	0.78	^ ^	—	73.59] ^] _x	0.63	= ^	0.7	_	17.54	(80)
West	0.9x			X		\dashv $\hat{\ }$			」^] x		$=$ $\frac{1}{x}$		= =		(80)
West	0.9x	0.77			0.78	=		45.59	-	0.63	- ^ x	0.7	=	10.87	(80)
West	0.9x	0.77		X	0.78	x		24.49] X]	0.63	=	0.7	_ =	5.84	= ' '
WOSt	0.98	0.77		X	0.78	Х		16.15	X	0.63	X	0.7	=	3.85	(80)
Solora	oine in	wotto or	doulo	tod	for oach m	onth			(02)~	- Sum(74)m	(92)~				
(83)m=	13.97	27.32	44.9	-	for each me	.42	82.32	78.37	67.	$\frac{1 = Sum(74)m}{32}$ 52.33	32.42		11.48	1	(83)
` '					(84)m = (73)					-	1	1]	, ,
Ţ	289.77	301.56	311.0	_	` 		310.14	297.86	291	.16 282.68	275.8	7 275.87	280.8]	(84)
L	on inter	nol tomp	orotu	ro /	haating oo	2000)		l .	l						
					heating sea	ĺ	a oroo	from Tol	blo O	Th1 (°C)					(85)
-		•		•	eriods in the	•			DIE 9	, IIII (C)				21	(00)
Otilisa		Feb		$\overline{}$	ving area, h			Jul	Ι ,	ug Sep	T 00	t Nov	Doo	1	
(86)m=	Jan 0.99	0.99	Ma 0.98	$\overline{}$		/lay 89	Jun 0.73	0.55	0.5		Oc 0.96	_	Dec 1	1	(86)
L		<u> </u>						<u> </u>		!	0.90	0.33	<u> </u>]	(00)
Г				_	ving area T			i –	1		1 00 0	2 00 00	00.00	1	(07)
(87)m=	20.07	20.16	20.3	4	20.59 20	.82	20.96	20.99	20.	99 20.92	20.60	20.33	20.06	J	(87)

_							_							
•			neating p				i					l		(00)
(88)m=	20.06	20.07	20.07	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.08	20.08		(88)
			ains for			· `	i							(0.0)
(89)m=	0.99	0.99	0.98	0.95	0.86	0.65	0.45	0.48	0.75	0.94	0.98	0.99		(89)
Mean	interna	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.83	18.97	19.23	19.6	19.91	20.07	20.1	20.1	20.03	19.7	19.23	18.83		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.54	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.5	19.61	19.82	20.13	20.39	20.55	20.58	20.58	20.51	20.21	19.82	19.49		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.5	19.61	19.82	20.13	20.39	20.55	20.58	20.58	20.51	20.21	19.82	19.49		(93)
8. Spa	ace hea	ting requ	uirement											
			ternal ter or gains	•		ned at sto	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm			ļ.	ļ							
(94)m=	0.99	0.99	0.98	0.95	0.87	0.69	0.5	0.54	0.79	0.95	0.98	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m=	287.19	297.79	304.07	302.13	279	215.21	150.06	156.49	222.04	260.72	271.28	278.67		(95)
Mo <mark>nt</mark>	nly avera	age ex <mark>te</mark>	ernal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	los <mark>s rate</mark>	for me	an intern		erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	605.93	584.2	527.28	436.59	336.74	226.7	151.62	158.73	245.74	372.29	496.14	600.51		(97)
			ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻				
(98)m=	237.15	192.47	166.07	96.82	42.96	0	0	0	0	83	161.9	239.45		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1219.81	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								31.28	(99)
9a. En	ergy rec	uiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heatir	_			/I-							ı		¬(004)
	-		at from s			mentary	-	(222)	(00.1)				0	(201)
			at from m	•	` '			(202) = 1	, ,				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 – ((203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g systen	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heatin	g require	ement (c	alculate	d above)								
	237.15	192.47	166.07	96.82	42.96	0	0	0	0	83	161.9	239.45		
(211)m	n = {[(98)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
	253.63	205.85	177.61	103.55	45.94	0	0	0	0	88.77	173.16	256.09		
				-	-	-		Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}		1304.61	(211)
•		`	econdar	• , .	month							•		
$= \{[(98)]$		0 (1)] } X 1	00 ÷ (20	0	0	0	0	0	0	0	0	0		
(210)111-				<u> </u>	<u> </u>	<u> </u>	l		l (kWh/yea				0	(215)
04	50 A D 00 '	2 Varaion	40400	(OAD 0.05)					, ,,,,,,,	,(-	₹15,1012		Paga	

Water heating								
Output from water heater (calculated above) 155.85 137.64 145.2 131.06 129.08 11	16.27 112.55	122.28	121.68	135.86	142.53	152.4		
Efficiency of water heater			<u> </u>	l	<u> </u>	l	79.8	(216)
(217)m= 85.93 85.71 85.17 84.02 82.23 7	79.8 79.8	79.8	79.8	83.55	85.15	86.01		(217)
Fuel for water heating, kWh/month								
(219) m = (64) m x $100 \div (217)$ m (219)m = 181.37 160.59 170.48 155.98 156.98 1	45.7 141.04	153.24	152.49	162.61	167.37	177.18		
	ļ.	Tota	I = Sum(2	19a) ₁₁₂ =		<u> </u>	1925.03	(219)
Annual totals				k	Wh/year	•	kWh/year	_
Space heating fuel used, main system 1							1304.61	
Water heating fuel used							1925.03	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							196.84	(232)
12a. CO2 emissions - Individual heating systems	s including m	icro-CHP)					
	Energy kWh/year			Emiss kg CO	ion fac	tor	Emissions	
Space heating (main system 1)	(211) x			0.2		=	281.8	(261)
Space heating (secondary)	(215) x			0.5	=	=	0	(263)
Water heating	(219) x			0.2	16	=	415.81	(264)
Space and water heating	(261) + (262)	+ (263) + ((264) =		_		697.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	102.16	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		838.69	(272)
						'		

TER =

(273)

21.5

		User [Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	Droporty	Strom	are Ve	rsion:		Versio	on: 1.0.4.26	
Address :		Property	Address	. D44_D	e Lean				
1. Overall dwelling dime	ensions:								
0 10			a(m²)	1	Av. He	ight(m)	٦	Volume(m ²	<u> </u>
Ground floor			75.7	(1a) x	2	2.8	(2a) =	211.96	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	ln)	75.7	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	211.96	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	_ = [0	X	40 =	0	(6a)
Number of open flues	0 + 0	_ + _	0	Ī = [0	X	20 =	0	(6b)
Number of intermittent fa	ns				0	x	10 =	0	(7a)
Number of passive vents				F	0	x	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X	40 =	0	(7c)
								nanges per ho	our
	ys, flues and fans = (6a)+(6b)+ een carried out or is intended, proce			continuo fi	0		\div (5) =	0	(8)
Number of storeys in the		ed 10 (17),	ourerwise (continue ii	OIII (9) 10 ((10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 fo	r mason	ry consti	ruction			0	(11)
if both types of wall are pu deducting areas of openin	resent, use the value corresponding	to the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate					12) + (13) ·			0	(16)
•	q50, expressed in cubic met	-	•	•	etre of e	envelope	area	3	(17)
•	ity value, then $(18) = [(17) \div 20] + (18)$ if a pressurisation test has been do				is heina u	sed		0.15	(18)
Number of sides sheltere		one or a de	gree an pe	meability	is being u	3CU		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified f	or monthly wind speed	_							-
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7							1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
, ,	3.00		1	<u> </u>		L		J	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		_	rate for t	he appli	cable ca	se	l					, 	
If mechanica				al.) (aa		(1	.=	. (00)	\			0.5	(23a
If exhaust air he) = (23a)			0.5	(23h
If balanced with		-	-	_								76.5	(230
a) If balance						- ` ` 	- ` ` - 	í `	r ´ `		- ` '	÷ 100]	.
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	J	(248
b) If balance		1					r Ó Ì	í `	r Ó - Ò	- 	1	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24)
c) If whole h if (22b)n				•					.5 × (23b	o)	_	_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)m				•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25
3. Heat losse	s and he	eat loss r	naramete	or.						_	_	_	_
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
Doo <mark>rs</mark>					2.5	x	1.3	=	3.25				(26
Vin <mark>dows</mark> Type	1				2.4	x1.	/[1/(1.3)+	0.04] =	2.97	Ħ			(27
Windows Type	2				2.6	x1.	/[1/(1.3)+	0.04] =	3.21	Ħ			(27
Vindows Type	3				2.6	x1.	/[1/(1.3)+	0.04] =	3.21	5			(27
Vindows Type	4				2.6	x1.	/[1/(1.3)+	0.04] =	3.21				(27
Vindows Type	5				2.6	x ₁ ,	/[1/(1.3)+	0.04] =	3.21	=			(27
Walls Type1	45.9	12	23.1		22.82	<u> </u>	0.15		3.42	=			(29
Valls Type2	20.1		0	=	20.16	=	0.14		2.85	=		╡╞	(29
otal area of e					66.08	=	0.11		2.00				(31
for windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	as aiven in	paragrapl	1 3.2	(01
* include the area								,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	3	, ,		
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				34.98	(33
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a)	(32e) =	0	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
or design assess an be used instea				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						3.3	(36
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			38.29	(37
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 19.59	19.37	19.14	18.03	17.81	16.69	16.69	16.47	17.14	17.81	18.25	18.7]	(38
Heat transfer o	coefficie	nt, W/K			•	•	•	(39)m	= (37) + (37)	38)m	•	•	
39)m= 57.88	57.65	57.43	56.32	56.09	54.98	54.98	54.76	55.42	56.09	56.54	56.98]	
	2 Version	. 1 0 4 26 /	(SAD 0 02)	http://ww	ww.stroma	com			L Average =	Sum(39)	12 /12=	56.26	age 2 of 38

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.76	0.76	0.76	0.74	0.74	0.73	0.73	0.72	0.73	0.74	0.75	0.75		
	ļ	!	Į.	ļ	Į.	!	<u> </u>		Average =	Sum(40) ₁	12 /12=	0.74	(40)
Number of day	/s in mo	nth (Tab	le 1a)										_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		38		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		.64		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)		•				
(44)m= 99.7	96.07	92.45	88.82	85.2	81.57	81.57	85.2	88.82	92.45	96.07	99.7		
									Total = Su	m(44) ₁₁₂ =		1087.62	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	m x nm x E	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m= 147.85	129.31	133.44	116.33	111.62	96.32	89.26	102.43	103.65	120.79	131.85	143.18		
									Total = Su	m(45) ₁₁₂ =		1426.04	(45)
If inst <mark>antane</mark> ous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46)	to (61)					
(46)m= 22.18	19.4	20.02	17.45	16.74	14.45	13.39	15.36	15.55	18.12	19.78	21.48		(46)
Water storage Storage volum		Vipeludir	na any co	olar or M	WHDC	ctorago	within or	amo voc	col				(47)
	,							airie ves	361	L	0		(47)
If community hotherwise if no	•			•			` '	ers) ente	er'∩'in (47)			
Water storage		not wate) (uno n	ioidaco i	iiotaiitai	10000 00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Croy Crit	JI O III ((77)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro				ear			(48) x (49)) =		1	10		(50)
b) If manufact		•			or is not	known:							()
Hot water stor	-			le 2 (kW	h/litre/da	ay)				0.	02		(51)
If community h	•		on 4.3										
Volume factor			2h							-	03		(52)
Temperature f							()	> .	>		.6		(53)
Energy lost fro Enter (50) or		_	, KVVh/ye	ear			(47) x (51)) x (52) x (53) =		03		(54)
` ,	. , .	,	طممم سما				((50) ((EE) (44).		1.	03		(55)
Water storage	ioss cai	culated	or each	montn		,	((56)M = ((55) × (41)	m •		1		
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	a solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	υ), else (5 ⁻	/)m = (56)	m where (H11) IS fro	m Appendi	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	• •	, ,						
(modified by		rom Tab	le H5 if t	here is s	solar wa	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combilees	ام معمل بمام	fa., a a a b		(C4)	(00) . 0	CE (44)	١						
Combi loss o	alculated	for each		(61)m =	(60) ÷ 30	05 × (41))m 0	0	0	0	0	1	(61)
	_!						<u> </u>	ļ	<u> </u>	<u> </u>	<u> </u>	(50) (64)	(01)
		188.71	eating ca	166.9	149.82	n montn 144.53	(62)M =	= 0.85 × ((45)m +	(46)m + 185.35	(57)m + 198.46	· (59)m + (61)m 1	(62)
(62)m= 203.1			<u> </u>			<u> </u>]	(02)
Solar DHW inputation									ir contribut	ion to wate	er neating)		
(63)m= 0	0	0	0	0	0	, see Ap	0	T 0	0	0	0	1	(63)
				Ů								I	(00)
Output from (64)m= 203.1		188.71	169.83	166.9	149.82	144.53	157.7	157.14	176.07	185.35	198.46]	
. ,		<u> </u>	<u> </u>			<u> </u>	<u> </u>	put from w	ļ	ļ	l12	2076.88	(64)
Heat gains fi	om water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)r	nl + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	_
(65)m= 93.38	1	88.59	81.48	81.34	74.82	73.9	78.28	77.26	84.38	86.64	91.83]	(65)
include (5	 7)m in cal	culation o	of (65)m	only if c	vlinder i:	s in the ເ	dwelling	or hot w	ater is f	om com	munity h	ı neating	
5. Internal	<u> </u>		. ,		,						,		
Metabolic ga													
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 118.8	1 118.81	118.81	118.81	118.81	118.81	118.81	118.81	118.81	118.81	118.81	118.81		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m= 18.74	16.65	13.54	10.25	7.66	6.47	6.99	9.08	12.19	15.48	18.07	19.26		(67)
App <mark>liance</mark> s g	jains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			1	
(68)m= 210.2	2 212.4	206.9	195.2	180.43	166.54	157.27	155.09	160.58	172.29	187.06	200.94		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)), also s	ee Table	5			•	
(69)m= 34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88		(69)
Pumps and f	ans gains	(Table 5	5a)									•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							•	
(71)m= -95.0	5 -95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05		(71)
Water heatin	g gains (1	Table 5)										-	
(72)m= 125.5	1 123.42	119.07	113.16	109.32	103.92	99.33	105.21	107.3	113.42	120.33	123.43		(72)
Total intern	al gains =	•			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 413.1	2 411.11	398.16	377.25	356.06	335.58	322.23	328.03	338.72	359.83	384.1	402.28		(73)
6. Solar gai	ns:												
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ Fobla 6b	_	FF		Gains	
	Table 6d		m²		Tai	ble 6a	. —	Fable 6b	_ '	able 6c		(W)	,
Northeast 0.9		X	2.	4	X 1	11.28	x	0.53	x	0.7	=	2.71	(75)
Northeast 0.9		X	2.	6	X 1	11.28	х	0.53	x	0.7	=	2.94	(75)
Northeast 0.9	0.0	х	2.	4	x 2	22.97	х	0.53	x	0.7	=	5.52	(75)
Northeast 0.9		X	2.	6	x 2	22.97	x	0.53	x	0.7	=	5.98	(75)
Northeast 0.9	0.3	X	2.	4	X 4	11.38	X	0.53	х	0.7	=	9.95	(75)

				1								_
Northeast _{0.9x}	0.3	X	2.6	X	41.38	X	0.53	X	0.7	=	10.78	(75)
Northeast _{0.9x}	0.3	X	2.4	X	67.96	X	0.53	X	0.7	=	16.34	(75)
Northeast _{0.9x}	0.3	х	2.6	X	67.96	X	0.53	X	0.7	=	17.7	(75)
Northeast _{0.9x}	0.3	X	2.4	X	91.35	X	0.53	X	0.7	=	21.96	(75)
Northeast _{0.9x}	0.3	X	2.6	X	91.35	X	0.53	X	0.7	=	23.79	(75)
Northeast _{0.9x}	0.3	x	2.4	X	97.38	x	0.53	X	0.7	=	23.41	(75)
Northeast 0.9x	0.3	X	2.6	x	97.38	x	0.53	x	0.7	=	25.36	(75)
Northeast _{0.9x}	0.3	X	2.4	X	91.1	x	0.53	x	0.7	=	21.9	(75)
Northeast _{0.9x}	0.3	X	2.6	X	91.1	x	0.53	x	0.7	=	23.73	(75)
Northeast 0.9x	0.3	X	2.4	x	72.63	x	0.53	x	0.7	=	17.46	(75)
Northeast _{0.9x}	0.3	x	2.6	x	72.63	x	0.53	x	0.7	=	18.92	(75)
Northeast _{0.9x}	0.3	x	2.4	x	50.42	x	0.53	x	0.7	=	12.12	(75)
Northeast _{0.9x}	0.3	x	2.6	х	50.42	x	0.53	x	0.7	=	13.13	(75)
Northeast _{0.9x}	0.3	х	2.4	х	28.07	x	0.53	x	0.7	=	6.75	(75)
Northeast _{0.9x}	0.3	x	2.6	x	28.07	x	0.53	x	0.7	=	7.31	(75)
Northeast _{0.9x}	0.3	х	2.4	х	14.2	x	0.53	x	0.7	=	3.41	(75)
Northeast _{0.9x}	0.3	x	2.6	х	14.2	x	0.53	x	0.7	=	3.7	(75)
Northeast _{0.9x}	0.3	X	2.4	X	9.21	Х	0.53	X	0.7	=	2.22	(75)
Northeast _{0.9x}	0.3	x	2.6	x	9.21	x	0.53	x	0.7	=	2.4	(75)
East 0.9x	0.77	x	2.6	х	19.64	×	0.53	x	0.7	=	26.26	(76)
East 0.9x	0.77	x	2.6	x	19.64	x	0.53	x	0.7	=	26.26	(76)
East 0.9x	0.77	x	2.6	х	19.64	Х	0.53	x	0.7	=	26.26	(76)
East 0.9x	0.77	x	2.6	x	38.42	X	0.53	x	0.7	=	51.37	(76)
East 0.9x	0.77	x	2.6	х	38.42	x	0.53	x	0.7	=	51.37	(76)
East 0.9x	0.77	x	2.6	x	38.42	x	0.53	x	0.7	=	51.37	(76)
East 0.9x	0.77	X	2.6	X	63.27	X	0.53	x	0.7	=	84.59	(76)
East 0.9x	0.77	X	2.6	X	63.27	x	0.53	x	0.7	=	84.59	(76)
East 0.9x	0.77	X	2.6	x	63.27	x	0.53	x	0.7	=	84.59	(76)
East 0.9x	0.77	X	2.6	X	92.28	X	0.53	x	0.7	=	123.37	(76)
East 0.9x	0.77	X	2.6	X	92.28	x	0.53	x	0.7	=	123.37	(76)
East 0.9x	0.77	X	2.6	X	92.28	x	0.53	x	0.7	=	123.37	(76)
East 0.9x	0.77	X	2.6	X	113.09	x	0.53	x	0.7	=	151.2	(76)
East 0.9x	0.77	X	2.6	X	113.09	x	0.53	x	0.7	=	151.2	(76)
East 0.9x	0.77	x	2.6	x	113.09	x	0.53	x	0.7	=	151.2	(76)
East 0.9x	0.77	x	2.6	x	115.77	x	0.53	x	0.7	=	154.78	(76)
East 0.9x	0.77	x	2.6	x	115.77	x	0.53	x	0.7	=	154.78	(76)
East 0.9x	0.77	x	2.6	x	115.77	x	0.53	x	0.7	=	154.78	(76)
East 0.9x	0.77	x	2.6	x	110.22	x	0.53	x	0.7	=	147.35	(76)
East 0.9x	0.77	x	2.6	x	110.22	x	0.53	x	0.7	=	147.35	(76)
East 0.9x	0.77	x	2.6	x	110.22	x	0.53	x	0.7	=	147.35	(76)
East 0.9x	0.77	X	2.6	X	94.68	x	0.53	X	0.7	=	126.58	(76)

East 0.9	9x 0.77	x	2.6		x	94.68	X	0.53	X	0.7	=	126.58	(76)
East 0.9	9x 0.77	X	2.6		x	94.68	X	0.53	x	0.7	=	126.58	(76)
East 0.9	0.77	X	2.6		x	73.59	X	0.53	x	0.7	=	98.38	(76)
East 0.9	0.77	X	2.6		x	73.59	X	0.53	x	0.7	=	98.38	(76)
East 0.9	0.77	X	2.6		x	73.59	x	0.53	x	0.7	=	98.38	(76)
East 0.9	0.77	X	2.6		x	45.59	X	0.53	x	0.7	=	60.95	(76)
East 0.9	9x 0.77	X	2.6		x	45.59	x	0.53	x	0.7		60.95	(76)
East 0.9	9x 0.77	X	2.6		x	45.59	x	0.53	x	0.7	=	60.95	(76)
East 0.9	9x 0.77	X	2.6		x	24.49	x	0.53	x	0.7	=	32.74	(76)
East 0.9	0.77	X	2.6		x	24.49	x	0.53	x	0.7	=	32.74	(76)
East 0.9	9x 0.77	X	2.6		x	24.49	x	0.53	x	0.7	=	32.74	(76)
East 0.9	9x 0.77	X	2.6		x	16.15	x	0.53	x	0.7	=	21.59	(76)
East 0.9	0.77	X	2.6		x	16.15	x	0.53	x	0.7	=	21.59	(76)
East 0.9	0.77	X	2.6		x	16.15	x	0.53	x	0.7	_	21.59	(76)
													
Solar gains	in watts, cal	lculated	for each	month			(83)m = \$	Sum(74)m .	(82)m				
(83)m= 84.4	12 165.6	274.5	404.15	499.34	513.11	487.69	416.1	320.41	196.91	105.33	69.39		(83)
Total gains	 internal ar 	nd solar	(84)m =	(73)m +	- (83)m	, watts		•				•	
(84)m= 497.	54 576.71	672.66	781.41	855.4	848.68	809.92	744.13	659.13	556.74	489.43	471.67		(84)
7 Mean in	ternal tempe	erature (heating s	season)			A						
	ire during he					from Tak	ole 9. Ti	n1 (°C)	_	_		21	(85)
	factor for ga							,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					(3.3)
	T	10111	ville arec	۸, ۱۱۱,۱۱۱	(000 11	abio ca,							
Ja	n I Febl	Mar	Apr	May I	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(86)m= 1	n Feb 0.99	Mar 0.95	Apr 0.81	May 0.6	Jun 0.41	Jul 0.3	Aug 0.34	Sep 0.58	Oct	Nov 0.99	Dec 1		(86)
(86)m= 1	0.99	0.95	0.81	0.6	0.41	0.3	0.34	0.58	_				(86)
(86)m= 1 Mean inter	0.99	0.95	0.81 ving area	0.6 a T1 (fo	0.41 Ilow ste	0.3 eps 3 to 7	0.34 7 in Tab	0.58 le 9c)	0.9	0.99	1		` ,
(86)m= 1 Mean inter (87)m= 20.3	0.99 rnal tempera 37 20.52	0.95 ature in li 20.74	0.81 iving area 20.94	0.6 a T1 (fo 20.99	0.41 ellow ste	0.3 eps 3 to 7	0.34 7 in Tab 21	0.58 le 9c)	_	0.99			(86) (87)
Mean inter (87)m= 20.3	o.99 rnal tempera rnal tempera round tempera round tempera round tempera	0.95 ature in li 20.74 eating pe	0.81 ving area 20.94 eriods in	0.6 a T1 (fo 20.99	0.41 Illow ste 21 dwelling	0.3 eps 3 to 7 21 g from Ta	0.34 7 in Tab 21 able 9, 1	0.58 le 9c) 21 Th2 (°C)	20.89	0.99	20.35		(87)
(86)m= 1 Mean inter (87)m= 20.3	o.99 rnal tempera rnal tempera round tempera round tempera round tempera	0.95 ature in li 20.74	0.81 iving area 20.94	0.6 a T1 (fo 20.99	0.41 ellow ste	0.3 eps 3 to 7	0.34 7 in Tab 21	0.58 le 9c)	0.9	0.99	1		` ,
(86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.2	o.99 rnal tempera rnal tempera round tempera round tempera round tempera	0.95 ature in li 20.74 eating pe	0.81 iving area 20.94 eriods in 20.3	0.6 a T1 (fo 20.99 rest of o	0.41 ollow ste 21 dwelling 20.32	0.3 eps 3 to 7 21 g from Ta 20.32	0.34 7 in Tab 21 able 9, 7 20.32	0.58 le 9c) 21 Th2 (°C)	20.89	0.99	20.35		(87)
(86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.2	nal tempera 20.52 ure during he 28 20.29 factor for ga	0.95 ature in li 20.74 eating pe	0.81 iving area 20.94 eriods in 20.3	0.6 a T1 (fo 20.99 rest of o	0.41 ollow ste 21 dwelling 20.32	0.3 eps 3 to 7 21 g from Ta 20.32	0.34 7 in Tab 21 able 9, 7 20.32	0.58 le 9c) 21 Th2 (°C)	20.89	0.99	20.35		(87)
(86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9	nal tempera 20.52 ure during he 28 20.29 factor for ga	0.95 ature in li 20.74 eating pe 20.29 sins for re 0.94	0.81 iving area 20.94 eriods in 20.3 est of dw 0.78	0.6 a T1 (fo 20.99 rest of c 20.3 velling, F	0.41 billow ster 21 dwelling 20.32 n2,m (s	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52	20.89 20.3 0.87	20.59	20.35		(87)
(86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9	nal tempera 20.52 ure during he 28 20.29 factor for ga 9 0.98	0.95 ature in li 20.74 eating pe 20.29 sins for re 0.94	0.81 iving area 20.94 eriods in 20.3 est of dw 0.78	0.6 a T1 (fo 20.99 rest of c 20.3 velling, F	0.41 billow ster 21 dwelling 20.32 n2,m (s	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52	20.89 20.3 0.87	0.99 20.59 20.3	20.35		(87)
Mean inter (87)m= 20.3 Temperate (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter	nal tempera 20.52 ure during he 28 20.29 factor for ga 9 0.98	0.95 ature in li 20.74 eating pe 20.29 ins for re 0.94 ature in the	0.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest o	0.6 a T1 (fo 20.99 rest of c 20.3 velling, r 0.56	0.41 ellow stern 21 dwelling 20.32 n2,m (s 0.37	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31	20.89 20.3 0.87 e 9c) 20.19	0.99 20.59 20.3	1 20.35 20.29 1 19.42	0.38	(87) (88) (89)
(86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4	nal tempera 20.52 ure during he 28 20.29 factor for ga 9 0.98 mal tempera	0.95 ature in li 20.74 eating pe 20.29 ains for re 0.94 ature in ti 19.97	0.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest of 20.23	0.6 a T1 (fo 20.99 rest of c 20.3 velling, r 0.56 of dwellin 20.3	0.41 ellow ste 21 dwelling 20.32 n2,m (s 0.37 ng T2 (20.32	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31	20.89 20.3 0.87 e 9c) 20.19	0.99 20.59 20.3 0.98	1 20.35 20.29 1 19.42	0.38	(87) (88) (89) (90)
Mean inter (87)m= 20.3 Temperate (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4	nal tempera 27 20.52 ure during he 28 20.29 factor for ga 9 0.98 rnal tempera 14 19.66	o.95 ature in li 20.74 eating pe 20.29 iins for re 0.94 ature in the state of t	o.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest or 20.23	0.6 a T1 (fo 20.99 rest of c 20.3 relling, r 0.56 of dwellin 20.3	0.41 ellow stern 21 dwelling 20.32 n2,m (s 0.37 ng T2 (20.32 ling) = 1	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 ft	20.89 20.3 0.87 e 9c) 20.19 LA = Liv	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4	1 20.35 20.29 1 19.42	0.38	(87) (88) (89) (90) (91)
(86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4 Mean inter (92)m= 19.7	nal tempera 20.52 ure during he 28 20.29 factor for ga 9 0.98 mal tempera 4 19.66 mal tempera 79 19.98	0.95 ature in li 20.74 eating pe 20.29 tins for re 0.94 ature in ti 19.97 ature (for 20.26	o.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest of 20.23 the who 20.5	0.6 a T1 (fo 20.99 rest of c 20.3 velling, r 0.56 of dwelling 20.3	0.41 step 21 dwelling 20.32 n2,m (s 0.37 ng T2 (20.32 ling) = 20.57	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32 fLA x T1 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 ft LA) x T2 20.57	20.89 20.3 0.87 e 9c) 20.19 LA = Liv	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4	1 20.35 20.29 1 19.42	0.38	(87) (88) (89) (90)
Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4 Mean inter (92)m= 19.7 Apply adju	o.99 rnal tempera 27 20.52 ure during he 28 20.29 factor for ga 9 0.98 rnal tempera 14 19.66 rnal tempera 29 19.98 stment to th	o.95 ature in li 20.74 eating per 20.29 sins for re 0.94 ature in the state of	o.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest of 20.23 the who 20.5 internal t	0.6 a T1 (fo 20.99 rest of c 20.3 relling, r 0.56 of dwellin 20.3 ble dwel 20.56	0.41 collow steel	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32 fLA × T1 20.57 om Table	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f 20.58 4 4e, wh	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 ft LA) × T2 20.57 ere approx	20.89 20.3 0.87 e 9c) 20.19 LA = Liv	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4) 20.09	1 20.35 20.29 1 19.42 4) =	0.38	(87) (88) (89) (90) (91)
(86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4 Mean inter (92)m= 19.7 Apply adju (93)m= 19.7	nal tempera 20.52 ure during he 28 20.29 factor for ga 9 0.98 rnal tempera 4 19.66 rnal tempera 79 19.98 stment to th 79 19.98	0.95 ature in li 20.74 eating pe 20.29 tins for re 0.94 ature in ti 19.97 ature (for 20.26 e mean 20.26	o.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest of 20.23 the who 20.5	0.6 a T1 (fo 20.99 rest of c 20.3 velling, r 0.56 of dwelling 20.3	0.41 step 21 dwelling 20.32 n2,m (s 0.37 ng T2 (20.32 ling) = 20.57	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32 fLA x T1 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 ft LA) x T2 20.57	20.89 20.3 0.87 e 9c) 20.19 LA = Liv	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4	1 20.35 20.29 1 19.42	0.38	(87) (88) (89) (90) (91)
(86)m = 1 Mean inter (87)m = 20.3 Temperatu (88)m = 20.2 Utilisation (89)m = 0.9 Mean inter (90)m = 19.4 Mean inter (92)m = 19.7 Apply adju (93)m = 19.7 8. Space h	o.99 rnal tempera 27 20.52 ure during he 28 20.29 factor for ga 9 0.98 rnal tempera 14 19.66 rnal tempera 29 19.98 stment to th 29 19.98 neating requi	o.95 ature in li 20.74 eating per 20.29 sins for re 0.94 ature in the state of	o.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest of 20.23 the who 20.5 internal the control of the	0.6 a T1 (fo 20.99 rest of c 20.3 relling, r 0.56 of dwellin 20.3 colle dwel 20.56 tempera 20.56	0.41 column display the state of the state	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32 fLA × T1 20.57 om Table 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f 20.58 4 4e, wh 20.58	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 fill LA) × T2 20.57 ere appro 20.57	20.89 20.3 0.87 e 9c) 20.19 LA = Liv 20.45 ppriate 20.45	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4) 20.09 20.09	1 20.35 20.29 1 19.42 19.77		(87) (88) (89) (90) (91)
Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4 Mean inter (92)m= 19.7 Apply adju (93)m= 19.7 8. Space h	nal tempera 20.52 ure during he 28 20.29 factor for ga 9 0.98 rnal tempera 4 19.66 rnal tempera 79 19.98 stment to th 79 19.98	o.95 ature in li 20.74 eating per 20.29 sins for re 0.94 ature in the state of	o.81 eving area 20.94 eriods in 20.3 est of dw 0.78 he rest of 20.23 the who 20.5 internal the control of	0.6 a T1 (fo 20.99 rest of o 20.3 relling, r 0.56 of dwellin 20.3 ble dwel 20.56 tempera 20.56	0.41 column display the state of the state	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32 fLA × T1 20.57 om Table 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f 20.58 4 4e, wh 20.58	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 fill LA) × T2 20.57 ere appro 20.57	20.89 20.3 0.87 e 9c) 20.19 LA = Liv 20.45 ppriate 20.45	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4) 20.09 20.09	1 20.35 20.29 1 19.42 19.77		(87) (88) (89) (90) (91)
Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4 Mean inter (92)m= 19.7 Apply adju (93)m= 19.7 8. Space h	nal tempera 27 20.52 ure during he 28 20.29 factor for ga 9 0.98 mal tempera 14 19.66 mal tempera 29 19.98 stment to th 29 19.98 neating require mean interion factor for	o.95 ature in li 20.74 eating per 20.29 sins for re 0.94 ature in the state of	o.81 eving area 20.94 eriods in 20.3 est of dw 0.78 he rest of 20.23 the who 20.5 internal the control of	0.6 a T1 (fo 20.99 rest of o 20.3 relling, r 0.56 of dwellin 20.3 ble dwel 20.56 tempera 20.56	0.41 column display the state of the state	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32 fLA × T1 20.57 om Table 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f 20.58 4 4e, wh 20.58	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 fill LA) × T2 20.57 ere appro 20.57	20.89 20.3 0.87 e 9c) 20.19 LA = Liv 20.45 ppriate 20.45	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4 20.09 20.09	1 20.35 20.29 1 19.42 19.77		(87) (88) (89) (90) (91)
Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4 Mean inter (92)m= 19.7 Apply adju (93)m= 19.7 Set Ti to the utilisate Ja	nal tempera 27 20.52 ure during he 28 20.29 factor for ga 9 0.98 mal tempera 14 19.66 mal tempera 29 19.98 stment to th 29 19.98 neating require mean interion factor for	o.95 ature in li 20.74 eating per 20.29 sins for re 0.94 ature in the state of	o.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest o 20.23 the who 20.5 internal t 20.5 experience asing Tab Apr	0.6 a T1 (fo 20.99 rest of o 20.3 relling, r 0.56 of dwellin 20.3 ble dwel 20.56 tempera 20.56	0.41 collow stern 21 dwelling 20.32 collow 20.37 collow Stern 20.37 dwelling 20.37 collow Stern 20.37 atture from 20.57 ed at stern 30.41	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32 fLA × T1 20.57 cm Table 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f 20.58 4 4e, wh 20.58	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 ft LA) × T2 20.57 ere appro 20.57	20.89 20.3 0.87 e 9c) 20.19 LA = Liv 20.45 priate 20.45	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4 20.09 20.09	1 20.35 20.29 1 1 19.42 4) = 19.77 19.77		(87) (88) (89) (90) (91)
Mean inter (87)m= 20.3 Temperatu (88)m= 20.2 Utilisation (89)m= 0.9 Mean inter (90)m= 19.4 Mean inter (92)m= 19.7 Apply adju (93)m= 19.7 Set Ti to the utilisate Ja	nal tempera 20.52 ure during he 28 20.29 factor for ga 9 0.98 nal tempera 4 19.66 rnal tempera 79 19.98 stment to th 79 19.98 neating require mean interion factor for ga	o.95 ature in li 20.74 eating per 20.29 sins for re 0.94 ature in the state of	o.81 iving area 20.94 eriods in 20.3 est of dw 0.78 he rest o 20.23 the who 20.5 internal t 20.5 experience asing Tab Apr	0.6 a T1 (fo 20.99 rest of o 20.3 relling, r 0.56 of dwellin 20.3 ble dwel 20.56 tempera 20.56	0.41 collow stern 21 dwelling 20.32 collow 20.37 collow Stern 20.37 dwelling 20.37 collow Stern 20.37 atture from 20.57 ed at stern 30.41	0.3 eps 3 to 7 21 g from Ta 20.32 ee Table 0.25 follow ste 20.32 fLA × T1 20.57 cm Table 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f 20.58 4 4e, wh 20.58	0.58 le 9c) 21 Th2 (°C) 20.31 0.52 7 in Table 20.31 ft LA) × T2 20.57 ere appro 20.57	20.89 20.3 0.87 e 9c) 20.19 LA = Liv 20.45 priate 20.45	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4 20.09 20.09	1 20.35 20.29 1 1 19.42 4) = 19.77 19.77		(87) (88) (89) (90) (91)

Section Sect	Useful gains, hmGm , W = (94)m x (84)m	
69 me		88 487.36 480.3 469.25 (95)
Heat loss rate for mean internal temperature, Lm , W = (33)m × (93)m × (93)m + (96)m] (97)m (98)m (97)m (98)m (97)m (98)m (98)	Monthly average external temperature from Table 8	
Sprace heating requirement for each month, KWh/month = 0.024 x (197)m = (85)m) x (41)m	(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.7	10.6 7.1 4.2 (96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		m]
Total per year (kWhylyear) = Sum(88) + 1		
Total per year (kWh/year) = Sum(96) . t.b. 2		
Space heating requirement in kWh/m²/year Sb. Energy requirements - Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none Fraction of space heat from community system 1 - (301) = The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources: the latter includes boiloids, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers Fraction of total space heat from Community boilers Fraction of total space heat from Community boilers Factor for control and charging method (Table 4c(3)) for community heating system 1 (303) Space heating Annual space heating requirement Space heating requirement from Secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = Water heating Annual water heating requirement If DHW from community boilers (64) x (303a) x (305) x (306) = Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans O (330a) Total electricity for the above, kWh/year = (330a) + (330b) + (330b) + (330g) = Energy for lighting (calculated in Appendix L) Space heating (alculated in Appendix L)	` '	
Sb. Energy requirements - Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none Fraction of space heat from community system 1 - (301) = The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources: the leater includes boliers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers Fraction of total space heat from Community boilers Fraction of total space heat from Community boilers Fraction of total space heating method (Table 4c(3)) for community heating system Space heating Space heating requirement Space heating requirement Space heating requirement Space heating requirement from secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system Space heating requirement from secondary/supplementary system Space heating requirement Space heating requ		
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none Fraction of space heat from community system 1 – (301) = 1 (302) The community system of the standard waste heat from several sources. The procedure allows for CHP and up to four other heat sources: the latter includes boliers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers Fraction of total space heat fro	<u> </u>	15.51
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none		ov a community scheme
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources: the latter includes boilers, heat jumps, geathermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers Fraction of total space heat from Community boilers Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system Number 1 10,05 (306) Space heating Annual space heating requirement Space heat from Community boilers Space heat from Community boilers Space heating requirement from secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating Annual water heating requirement from secondary/supplementary system (98) x (301) x 100 + (308) = Uater heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers (64) x (303a) x (305) x (306) = Electricity used for heat distribution 0.01 x ((307a)(307e) + (310a)(310e)] = Outside (310a) Electricity used for heat distribution 0.01 x ((307a)(307e) + (310a)(310e)] = Outside (310a) Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = Outside (310a) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans Outside (330a) Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = Ingr. 18 (330a) 197.18 (331) Energy for lighting (calculated in Appendix L)		
Includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers	Fraction of space heat from community system $1 - (301) =$	1 (302)
Fraction of heat from Community boilers (302) x (303a) = 1 (303a) Fraction of total space heat from Community boilers (302) x (303a) = 1 (304a) Factor for control and charging method (Table 4c(3)) for community heating system 1 (305) Distribution loss factor (Table 12c) for community heating system 1.05 (306) Space heating kWh/year Annual space heat from Community boilers (88) x (304a) x (305) x (306) = 1256.39 (307a) Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308) Space heating requirement from secondary/supplementary system (98) x (301) x (100 + (308) = 0 (309) 0 (309) Water heating Annual water heating requirement 2076.88 If DHW from community scheme: (64) x (303a) x (305) x (306) = 2180.73 (310a) 2180.73 (310a) Electricity used for heat distribution 0.01 x ((307a)(307e) + (310a)(310e)] = 34.37 (313) (313) Cooling System Energy Efficiency Ratio 0 (314) Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) 0 (316) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside 197.18 (330a) warm air heating system fans 0 (330b)		nd up to four other heat sources; the latter
Fraction of total space heat from Community boilers Factor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement Space heat from Community boilers Fificiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system Annual water heating requirement If DHW from Community boilers Fif DH		1 (303a)
Pactor for control and charging method (Table 4c(3)) for community heating system Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement Space heat from Community boilers Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating Annual water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans Distribution on the fixed properties of the prope		
Space heating Annual space heat from Community boilers Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system (98) x (301) x 100 + (308) = 0 (308) Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers Electricity used for heat distribution Out x ((307a)(307e) + (310a)(310e) = 34.37 (313) Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans Outside (330a) pump for solar water heating Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L) Space cooling lighting (calculated in Appendix L)	Factor for control and charging method (Table 4c(3)) for community heating s	vstem 1 (305)
Annual space heating requirement Space heat from Community boilers (98) x (304a) x (305) x (306) = 1256.39 (307a) Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = 0 (309) Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers (64) x (303a) x (305) x (306) = 2180.73 (310a) Electricity used for heat distribution 0.01 x [(307a)(307e) + (310a)(310e)] = 34.37 (313) Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L)		
Annual space heating requirement Space heat from Community boilers (98) x (304a) x (305) x (306) = 1256.39 (307a) Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = 0 (309) Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers (64) x (303a) x (305) x (306) = 2180.73 (310a) Electricity used for heat distribution 0.01 x [(307a)(307e) + (310a)(310e)] = 34.37 (313) Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L)	Space heating	kWh/year
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers Water heat distribution O.01 × [(307a)(307e) + (310a)(310e)] = 34.37 (313) Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans D (330a) Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L)		
Space heating requirement from secondary/supplementary system Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers (64) × (303a) × (305) × (306) = Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans D (330b) pump for solar water heating Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = Energy for lighting (calculated in Appendix L) Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside 197.18 (330a) (330b) Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 197.18 (331)	Space heat from Community boilers (98) x	(304a) x (305) x (306) = 1256.39 (307a)
Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community boilers Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year Energy for lighting (calculated in Appendix L) 2076.88 (64) × (303a) × (305) × (306) = 2180.73 (310a) 2180.73 (311a) 2076.88 (310a) (314) 519 (315) Electricity used for heat distribution 0 (314) 519 (314) 197.18 (330a) 330a) 330a) Total electricity for the above, kWh/year (330a) + (330b) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L)	Efficiency of secondary/supplementary heating system in % (from Table 4a o	r Appendix E) 0 (308
Annual water heating requirement If DHW from community scheme: Water heat from Community boilers Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans Double (330a) pump for solar water heating Total electricity for the above, kWh/year Energy for lighting (calculated in Appendix L) Electricity for pumps and fans within dwelling (Table 4f): 197.18 1330a) 1310a) 1310a 1310	Space heating requirement from secondary/supplementary system (98) x	$(301) \times 100 \div (308) = 0$ (309)
If DHW from community scheme: Water heat from Community boilers (64) × (303a) × (305) × (306) = 2180.73 (310a) Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] = 34.37 (313) Cooling System Energy Efficiency Ratio 5 pace cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L) 330.98 (332)	Water heating	
Water heat from Community boilers $(64) \times (303a) \times (305) \times (306) =$ 2180.73 $(310a)$ Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] =$ 34.37 (313) Cooling System Energy Efficiency Ratio 0 (314) Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$ 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside $(330a)$ warm air heating system fans $(330a)$ warm air heating system fans $(330a)$ Total electricity for the above, kWh/year $(330a) + (330a) + (330b) + (330g) =$ $(330a)$ Energy for lighting (calculated in Appendix L) $(330a)$ (332)	Annual water heating requirement	2076.88
Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L) 330.98 (332)		(303a) x (305) x (306) = 2180.73 (310a)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$ 0 (315) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year = $(330a) + (330b) + (330g) =$ 197.18 (331) Energy for lighting (calculated in Appendix L) 330.98 (332)	Electricity used for heat distribution 0.01 × [(30)	7a)(307e) + (310a)(310e)] = 34.37 (313)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L) 330.98 (332)	Cooling System Energy Efficiency Ratio	0 (314)
mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year Energy for lighting (calculated in Appendix L) 197.18 (330a) (330b) (330g) (330g) 197.18 (331) (331)	Space cooling (if there is a fixed cooling system, if not enter 0) = (10)	7) ÷ (314) = 0 (315)
warm air heating system fans pump for solar water heating Total electricity for the above, kWh/year Energy for lighting (calculated in Appendix L) 0 (330b) (330g) 197.18 (331) 330.98 (332)	Electricity for pumps and fans within dwelling (Table 4f):	
pump for solar water heating Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L) 330.98 (332)	mechanical ventilation - balanced, extract or positive input from outside	197.18 (330a)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 197.18 (331) Energy for lighting (calculated in Appendix L) 330.98 (332)	warm air heating system fans	0 (330b)
Energy for lighting (calculated in Appendix L) 330.98 (332)	pump for solar water heating	0 (330g)
	Total electricity for the above, kWh/year =(330	a) + (330b) + (330g) = 197.18 (331)
12b. CO2 Emissions – Community heating scheme	Energy for lighting (calculated in Appendix L)	330.98 (332)
		<u> </u>

Energy

-∵ฮง kWh/year

kg CO2/year

Emission factor Emissions

kg CO2/kWh

CO2 from other sources of space and w Efficiency of heat source 1 (%)	• (P) sing two fuels repeat (363) to (36	66) for the secor	nd fuel	90	(367a)
CO2 associated with heat source 1	[(307	b)+(310b)] x 100 ÷ (367b) x	0.22] = [824.91	(367)
Electrical energy for heat distribution		[(313) x	0.52] = [17.84	(372)
Total CO2 associated with community s	ystems	(363)(366) + (368)(372)		= [842.75	(373)
CO2 associated with space heating (see	condary)	(309) x	0] = [0	(374)
CO2 associated with water from immers	sion heater or instanta	aneous heater (312) x	0.22] = [0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			842.75	(376)
CO2 associated with electricity for pump	os and fans within dw	elling (331)) x	0.52] = [102.33	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52] = [171.78	(379)
Total CO2, kg/year	sum of (376)(382) =				1116.86	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.75	(384)
El rating (section 14)					87.6	(385)



		User [Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	Droporty	Strom Softwa	are Ve	rsion:		Versio	on: 1.0.4.26	
Address :		Property	Address	. D44_D	e Lean				
1. Overall dwelling dime	ensions:								
0 10			a(m²)	1	Av. He	ight(m)	٦	Volume(m ³	<u> </u>
Ground floor			75.7	(1a) x	2	2.8	(2a) =	211.96	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(In)	75.7	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	211.96	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	_ = [0	X	40 =	0	(6a)
Number of open flues	0 + 0	_ + [0	Ī = [0	X	20 =	0	(6b)
Number of intermittent fa	ns				3	x	10 =	30	(7a)
Number of passive vents				F	0	x	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X	40 =	0	(7c)
								nanges per ho	our
	ys, flues and fans = (6a)+(6b)+ een carried out or is intended, proce			continue fr	30		\div (5) =	0.14	(8)
Number of storeys in the		cu to (17),	ou ioi wise t	Sommac II	0111 (3) 10 ((10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are po deducting areas of openion	resent, use the value corresponding	to the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic metrity value, then $(18) = [(17) \div 20]$ -	•	•	•	etre of e	envelope	area	5	(17)
•	ity value, then $(10) = 1(17) \div 20$ is if a pressurisation test has been d				is beina u	sed		0.39	(18)
Number of sides sheltere		5/10 0/ u uo	groo an po	modelinty	io boilig a	oou		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18) x (20) =				0.33	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7							1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
, ,	1 32 300			<u> </u>				J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.42	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39]	
Calculate effec	ctive air	change i	rate for t	he appli	cable ca	se	ļ	!	!	!	!	J 	
												0	(23
) = (23a)			0	(23)
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(230
a) If balance	d mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m = 0	0	0	0	0	0	0	0	0	0	0	0]	(24a
b) If balance	d mech	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		,	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24)
•				•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24)
•				•	•				0.5]				
(24d)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58]	(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)	•	•	•		
(25)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
3 Hoat losso	e and he	at lose r	naram o t	or:									
ELEMENT	Gros	SS	Openin	gs					A X U (W/	K)			A X k kJ/K
Doors					2.5	x	1.2	=	3				(26)
Win <mark>dows</mark> Type	Case Case												
Windows Type	2				2.07	x1,	/[1/(1.4)+	0.04] =	2.74	Ħ			(27)
Windows Type	3				2.07	x1,	/[1/(1.4)+	0.04] =	2.74	5			(27)
Windows Type	e 4				2.07		/[1/(1.4)+	0.04] =	2.74	一			(27)
Windows Type	e 5					=	/[1/(1.4)+	0.04] =		=			, ,
Walls Type1		12	18.0			=				=		¬ г	
Walls Type2						=	<u> </u>	_		북 ¦		륏 누	
						=	0.10		3.03				
			effective wi	ndow H-va			ı formula 1	/[(1/LI-valu	ıe)+0 041 a	as aiven in	naragranl	132	(31)
						a.ca a.cg		, [(.0, .0.0 ., 0	g.v. c	pa.ag.ap.	. 0.2	
Fabric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				33.2	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
=				constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						3.3	(36)
		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			36.5	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 41.27	41.03	40.79	39.66	39.45	38.47	38.47	38.29	38.85	39.45	39.88	40.32		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 77.81	77.57	77.33	76.2	75.99	75.01	75.01	74.83	75.39	75.99	76.42	76.86		
Stroma FSAP 201	2 Version:	1.0.4.26 (SAP 9.92)	- http://w\	ww.stroma	.com			Average =	Sum(39) ₁	12 /12=	76.	Page 2 (38)

Heat loss para	ımeter (l	HLP). W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.03	1.02	1.02	1.01	1	0.99	0.99	0.99	1	1	1.01	1.02		
	ļ			ļ		<u> </u>	ļ		L Average =	Sum(40) ₁	12 /12=	1.01	(40)
Number of day	/s in mo	nth (Tab	le 1a)									1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		38		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		.64		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	!	!	•			
(44)m= 99.7	96.07	92.45	88.82	85.2	81.57	81.57	85.2	88.82	92.45	96.07	99.7		
		•				•				m(44) ₁₁₂ =		1087.62	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 147.85	129.31	133.44	116.33	111.62	96.32	89.26	102.43	103.65	120.79	131.85	143.18		_
If instantaneous w	vater heati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =		1426.04	(45)
	_					_			40.40	40.70	04.40		(46)
(46)m= 22.18 Water storage	19.4 loss:	20.02	17.45	16.74	14.45	13.39	15.36	15.55	18.12	19.78	21.48		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage											,		
a) If manufact				or is kno	wn (kWl	n/day):				1.	39		(48)
Temperature f										0.	54		(49)
Energy lost fro		•			!4		(48) x (49)) =		0.	75		(50)
b) If manufactHot water stora			-								0		(51)
If community h	-			.0 2 (, ,	~ 3 /					O		(01)
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (55)								0.	75		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m =	(58) ÷ 36	65 × (41)	m					
(modified by		rom Tab	le H5 if t	here is s	solar wa	ter heati	ng and a	cylinde	r thermo	stat)	· · · · · ·		
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calc	culated t	for each	month ((61)m =	(60) ÷	365 × (41)m							
(61)m= 0	0	0	0	0	0	0)	0	0	0	0]	(61)
	ired for	water he	eating ca	alculated	l for ea	 ch month	(62)	—— m =	0.85 × ((45)m +	(46)m +	(57)m +	י - (59)m + (61)m	
(62)m= 194.45	171.4	180.03	161.43	158.22			`	_	148.74	167.39	176.95	189.78	1	(62)
Solar DHW input ca	alculated u	using App	endix G oı	· Appendix	H (nega	tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	<u>.</u>	
(add additional	lines if I	FGHRS	and/or \	VWHRS	applie	s, see Ap	pend	dix G	3)					
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0		(63)
Output from wat	ter heat	er											_	
(64)m= 194.45	171.4	180.03	161.43	158.22	141.42	135.85	149	.02	148.74	167.39	176.95	189.78		_
								Outp	out from wa	ater heate	er (annual)	112	1974.66	(64)
Heat gains from	water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	1 + (6	1)m] + 0.8 x	([(46)m	+ (57)m	+ (59)m	ຼ]	
(65)m= 86.44	76.66	81.64	74.75	74.39	68.1	66.95	71.	33	70.54	77.44	79.91	84.88]	(65)
include (57)m	n in calc	ulation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal gain	ns (see	Table 5	and 5a):										
Metabolic gains	(Table	5), Wat	ts			_	_			_			_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec]	
(66)m= 118.81	118.81	118.81	118.81	118.81	118.81	118.81	118	.81	118.81	118.81	118.81	118.81		(66)
Lighting gains (calculat	ed in Ap	pendix	L, equat	ion L9	or L9a), <mark>a</mark>	lso s	ee	Table 5					
(67)m= 18.75	16.66	13.55	10.25	7.67	6.47	6.99	9.0	9	12.2	15.49	18.08	19.27		(67)
App <mark>liance</mark> s gain	ns (ca <mark>lcı</mark>	ulated in	Append	dix L, eq	uation	L13 or L1	<mark>3</mark> a),	also	see Tal	ble 5				
(68)m= 210.22	212.4	206.9	195.2	180.43	166.54	157.27	155	.09	160.58	172.29	187.06	200.94		(68)
Cooking gains ((calcula	ted in A	opendix	L, equat	ion L1	5 or L15a), als	o se	e Table	5				
(69)m= 34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.	88	34.88	34.88	34.88	34.88		(69)
Pumps and fans	s gains	(Table 5	ā)											
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. eva	aporatio	n (negat	ive valu	es) (Tab	le 5)								_	
(71)m= -95.05	Data In eat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (69)m + (61)m (62)m = 144.6													
Water heating g	gains (T	able 5)											_	
(72)m= 116.18	114.08	109.74	103.83	99.99	94.58	89.99	95.	88	97.97	104.09	110.99	114.09]	(72)
Total internal g	gains =				(6	6)m + (67)n	า + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m	_	
(73)m= 406.79	404.78	391.83	370.92	349.73	329.24	315.9	321	1.7	332.4	353.51	377.78	395.95		(73)
6. Solar gains:														
J		ŭ				•	ations	to co	nvert to th	e applica		tion.		
		actor						т		7				
							1						. ,	٦
<u> </u>		=			X		X		0.63	╡╞		_ =		╡
<u> </u>		=			-		J 7			╡╞		=		=
<u> </u>		=			×] 1			╡╞		=		╡
<u> </u>	0.3	X	2.0)7	x	22.97	X	<u></u>	0.63	×		=	5.66	╡
Northeast _{0.9x}	0.3	X	1.9)1	x	41.38	X		0.63	X	0.7	=	9.41	(75)

				ı								_
Northeast 0.9x	0.3	X	2.07	X	41.38	X	0.63	X	0.7	=	10.2	(75)
Northeast _{0.9x}	0.3	X	1.91	X	67.96	X	0.63	X	0.7	=	15.45	(75)
Northeast 0.9x	0.3	х	2.07	X	67.96	X	0.63	X	0.7	=	16.75	(75)
Northeast _{0.9x}	0.3	X	1.91	X	91.35	X	0.63	X	0.7	=	20.77	(75)
Northeast _{0.9x}	0.3	X	2.07	X	91.35	X	0.63	X	0.7	=	22.51	(75)
Northeast _{0.9x}	0.3	x	1.91	X	97.38	X	0.63	X	0.7	=	22.15	(75)
Northeast _{0.9x}	0.3	X	2.07	x	97.38	x	0.63	X	0.7	=	24	(75)
Northeast _{0.9x}	0.3	X	1.91	X	91.1	x	0.63	X	0.7	=	20.72	(75)
Northeast _{0.9x}	0.3	X	2.07	X	91.1	x	0.63	X	0.7	=	22.45	(75)
Northeast 0.9x	0.3	X	1.91	x	72.63	x	0.63	X	0.7	=	16.52	(75)
Northeast _{0.9x}	0.3	x	2.07	x	72.63	x	0.63	X	0.7	=	17.9	(75)
Northeast _{0.9x}	0.3	x	1.91	x	50.42	x	0.63	X	0.7	=	11.47	(75)
Northeast _{0.9x}	0.3	x	2.07	х	50.42	x	0.63	X	0.7	=	12.43	(75)
Northeast _{0.9x}	0.3	х	1.91	х	28.07	x	0.63	X	0.7	=	6.38	(75)
Northeast _{0.9x}	0.3	x	2.07	x	28.07	x	0.63	X	0.7	=	6.92	(75)
Northeast _{0.9x}	0.3	х	1.91	х	14.2	x	0.63	X	0.7	=	3.23	(75)
Northeast _{0.9x}	0.3	x	2.07	х	14.2	x	0.63	X	0.7	=	3.5	(75)
Northeast _{0.9x}	0.3	X	1.91	X	9.21	Х	0.63	X	0.7	=	2.1	(75)
Northeast _{0.9x}	0.3	x	2.07	x	9.21	x	0.63	x	0.7	=	2.27	(75)
East 0.9x	0.77	x	2.07	х	19.64	×	0.63	x	0.7	=	24.85	(76)
East 0.9x	0.77	x	2.07	x	19.64	x	0.63	x	0.7	=	24.85	(76)
East 0.9x	0.77	x	2.07	х	19.64	Х	0.63	x	0.7	=	24.85	(76)
East 0.9x	0.77	x	2.07	x	38.42	X	0.63	x	0.7	=	48.61	(76)
East 0.9x	0.77	x	2.07	х	38.42	x	0.63	x	0.7	=	48.61	(76)
East 0.9x	0.77	x	2.07	x	38.42	x	0.63	X	0.7	=	48.61	(76)
East 0.9x	0.77	X	2.07	X	63.27	X	0.63	X	0.7	=	80.06	(76)
East 0.9x	0.77	X	2.07	x	63.27	x	0.63	X	0.7	=	80.06	(76)
East 0.9x	0.77	x	2.07	x	63.27	x	0.63	X	0.7	=	80.06	(76)
East 0.9x	0.77	X	2.07	X	92.28	X	0.63	X	0.7	=	116.76	(76)
East 0.9x	0.77	X	2.07	X	92.28	x	0.63	X	0.7	=	116.76	(76)
East 0.9x	0.77	X	2.07	X	92.28	x	0.63	X	0.7	=	116.76	(76)
East 0.9x	0.77	x	2.07	x	113.09	x	0.63	X	0.7	=	143.09	(76)
East 0.9x	0.77	X	2.07	x	113.09	x	0.63	X	0.7	=	143.09	(76)
East 0.9x	0.77	x	2.07	x	113.09	x	0.63	X	0.7	=	143.09	(76)
East 0.9x	0.77	X	2.07	x	115.77	x	0.63	X	0.7	=	146.48	(76)
East 0.9x	0.77	x	2.07	x	115.77	x	0.63	x	0.7	=	146.48	(76)
East 0.9x	0.77	x	2.07	x	115.77	x	0.63	x	0.7	=	146.48	(76)
East 0.9x	0.77	x	2.07	x	110.22	x	0.63	x	0.7	=	139.45	(76)
East 0.9x	0.77	x	2.07	x	110.22	x	0.63	x	0.7	=	139.45	(76)
East 0.9x	0.77	x	2.07	x	110.22	x	0.63	X	0.7	j =	139.45	(76)
East 0.9x	0.77	x	2.07	x	94.68	x	0.63	X	0.7	=	119.79	(76)

	ast 0.9x 0.77 x 2.07 x 0.468 x 0.62 x 0.7 - 110.70 (76)																
East	0.9x).77	X	2.0)7	X	9	4.68	x	0.63		X	0.7	=	119.	79 (76	3)
East	0.9x).77	X	2.0)7	x	9	4.68	x	0.63		x	0.7	=	119.	79 (76	3)
East	0.9x).77	X	2.0)7	x	7	3.59	X	0.63		x	0.7	=	93.1	1 (76	3)
East	0.9x).77	X	2.0)7	x	7	3.59	x	0.63		x	0.7	=	93.1	1 (76	3)
East	0.9x).77	X	2.0)7	x	7	3.59	X	0.63		x	0.7	=	93.1	1 (76	3)
East	0.9x).77	x	2.0)7	x	4	5.59	x	0.63		x	0.7		57.6	(76	3)
East	0.9x).77	X	2.0)7	x	4	5.59	x	0.63		x	0.7	_ =	57.6	68 (76	3)
East	0.9x).77	x	2.0)7	x	4	5.59	х	0.63		x	0.7	_ =	57.6	68 (76	3)
East	0.9x).77	x	2.0)7	x	2	4.49	х	0.63		x	0.7	=	30.9	08 (76	3)
East	0.9x).77	х	2.0)7	x	2	4.49	x	0.63		x	0.7		30.9	08 (76	3)
East	0.9x).77	X	2.0)7	x	2	4.49	x	0.63		x	0.7	╡ -	30.9	8 (76	3)
East	0.9x).77	x	2.0)7	x	1	6.15	x	0.63		x	0.7	_ =	20.4	4 (76	3)
East	0.9x).77	X	2.0)7	x	1	6.15	X	0.63		x	0.7	╡ -	20.4	4 (76	3)
East	0.9x).77	X	2.0)7	x	1	6.15	X	0.63		x	0.7	╡ -	20.4	4 (76	3)
			_									L					
Solar gair	ns in watt	s. calcul	ated	for eacl	h month	h			(83)m	= Sum(74)m(8	32)m					
1 —			-	382.47	472.56	$\overline{}$	85.58	461.53	393.	78 303.	22 18	86.34	99.68	65.67	7	(83	3)
Total gair	East																
(84)m= 48	East		1)														
7 Mean	internal t	emperat	ture (heating	seasoi	n)			À								
				<u> </u>		rá e	area f	from Tak	ble 9	Th1 (°C)		_		21	(85	5)
						_			,,	,,,,	,						,
Cilloano	in idotoi i							ble 9a)									
	Jan F		П						I Au	ua Se	g	Oct	Nov	Dec	7		
_		eb N	1ar	Apr	May		Jun	Jul	 						7	(86	5)
(86)m=	1 0.9	9 0.	1ar 98	Apr 0.92	May 0.78		Jun).58	Jul 0.42	0.4	8 0.75					3	(86	5)
(86)m=	1 0.9	9 0.	lar 98 e in li	Apr 0.92 ving are	May 0.78 ea T1 (f	follo	Jun 0.58 w ste	Jul 0.42 ps 3 to 7	0.4 7 in T	8 0.79 able 9c)	5 (0.96	0.99	1]	· ·	
(86)m= Mean int (87)m= 1	1 0.9 ternal tem 9.97 20.	9 0.0 perature 12 20	98 e in li	Apr 0.92 ving are 20.71	0.78 ea T1 (f	follo 2	Jun 0.58 w ste	Jul 0.42 ps 3 to 7 21	0.4 7 in T	able 9c)	95 2	0.96	0.99	1		· ·	
Mean int (87)m= 1	ternal tem 9.97 20. ature duri	peratur 12 20 ng heati	far 98 e in li .39	Apr 0.92 ving are 20.71 eriods ir	0.78 ea T1 (f 20.91	follo 2	Jun 0.58 w ste 20.99	Jul 0.42 ps 3 to 7 21 from Ta	0.4 7 in T 21 able 9	able 9c) 20.9	5 (05 2 C)	20.65	0.99	19.94		(87	7)
Mean int (87)m= 1	ternal tem 9.97 20. ature duri	peratur 12 20 ng heati	far 98 e in li .39	Apr 0.92 ving are 20.71 eriods ir	0.78 ea T1 (f 20.91	follo 2	Jun 0.58 w ste 20.99	Jul 0.42 ps 3 to 7 21 from Ta	0.4 7 in T 21 able 9	able 9c) 20.9	5 (05 2 C)	20.65	0.99	19.94		(87	7)
Mean int (87)m= 1 Tempera (88)m= 2	1 0.9 ternal term 9.97 20. ature during 20.06 20. on factor for	peratur 12 20 ng heati 06 20 or gains	e in li	Apr 0.92 ving are 20.71 eriods ir 20.08	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling,	follo 2 f dw	Jun 0.58 w ste 0.99 relling	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table	0.47 in T 21 able 9 20.0	able 9c) 20.9	5 (05 2 C)	20.65	20.25	19.94		(88	7) 3)
Mean int (87)m= 1 Tempera (88)m= 2	1 0.9 ternal term 9.97 20. ature during 20.06 20. on factor for	peratur 12 20 ng heati 06 20 or gains	e in li	Apr 0.92 ving are 20.71 eriods ir 20.08	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling,	follo 2 f dw 2 , h2,	Jun 0.58 w ste 0.99 relling 0.09 m (se	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table	0.47 in T 21 able 9 20.0	able 9c) 1 20.9 0, Th2 (°0	95 2 C)	20.65	20.25	19.94		(88	7) 3)
Mean int (87)m= 1 Tempera (88)m= 2 Utilisation (89)m=	1 0.9 ternal term 9.97 20. ature during 20.06 20. on factor for 1 0.9	peratur 12 20 ng heati 06 20 or gains 19 0.1	98 e in li .39 ng pe .07 for re	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72	follo 2 f dw 2 , h2,	Jun 0.58 w ste 20.99 relling 20.09 m (se 0.5	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34	0.47 in T 21 able 9 20.0 99a) 0.3	8 0.78 (able 9c) 1 20.9 0, Th2 (°C) 9 0.66	95 2 C) 99 2	0.96 20.65 20.08	20.25	19.94		(88	7) 3)
Mean inf (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m= Mean inf	1 0.9 ternal tem 9.97 20. ature duri 20.06 20. on factor f 1 0.9 ternal tem	peratur 12 20 ng heati 16 20 or gains 19 0.1	e in li one in ti	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 the rest	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel	f dw 2 2, h2,	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 ollow ste	0.47 in T 212 able 9 20.0 9a) 0.3	8 0.78 (able 9c) 20.9 7, Th2 (°C) 9 0.66 to 7 in T	05 2 C) 09 2 8 (Cable 9	0.96 20.65 20.08 0.94 9c)	0.99 20.25 20.08	1 19.94 20.07		(88	77) 33)
Mean inf (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m= Mean inf	1 0.9 ternal tem 9.97 20. ature duri 20.06 20. on factor f 1 0.9 ternal tem	peratur 12 20 ng heati 16 20 or gains 19 0.1	e in li one in ti	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 the rest	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel	f dw 2 2, h2,	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 ollow ste	0.47 in T 212 able 9 20.0 9a) 0.3	8 0.78 (able 9c) 20.9 7, Th2 (°C) 9 0.66 to 7 in T	95 2 C) 99 2 Sable 9	0.96 20.65 20.08 20.08 0.94 9c) 9.68	0.99 20.25 20.08 0.99	1 19.94 20.07		(87 (88 (89	77) 33) 9))
Mean int (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m= Mean int (90)m= 1	1 0.9 ternal tem 9.97 20. ature duri 20.06 20. on factor fr 1 0.9 ternal tem 8.68 18.	peratur 12 20 ng heati 06 20 or gains 9 0. peratur 91 19	e in li .39 ng pe .07 for re .97 e in tl .29	Apr 0.92 ving are 20.71 eriods in 20.08 est of de 0.9 he rest	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20	follo 2 f dw 2 h2, h2, 2 llling 2	Jun 0.58 w ste 20.99 relling 20.09 m (se 0.5 T2 (fo	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 ollow ste 20.09	0.4 7 in T 21 able 9 20.0 9a) 0.3 eps 3	8 0.78 (able 9c) 1 20.9 0, Th2 (°C) 9 0.66 to 7 in T	95 2 C) 99 2 8 (able 9 95 1 fLA	0.96 20.65 20.08 20.08 0.94 9c) 9.68	0.99 20.25 20.08 0.99	1 19.94 20.07		(87 (88 (89	77) 33) 9))
Mean inf (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m= Mean inf (90)m= 1	1 0.9 ternal tern 9.97 20. ature duri 20.06 20. on factor for 1 0.9 ternal tern 8.68 18.	peratur 12 20 ng heati 16 20 or gains 19 0.1 peratur 19 19	e in ti	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 he rest 19.75	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20	follo 2 f dw 2 h2, h2, elling	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5 T2 (fo 0.08	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 ollow ste 20.09	0.47 in T 21 able 9 20.0 9a) 0.3 eps 3 20.0	8 0.78 (able 9c) 1 20.9 (b), Th2 (°C) 20.0 (c) 9 0.66 (to 7 in T) (c) 9 20.0 (c) - fLA) ×	205 2 C) 299 2 Sable 9 55 1 fLA	0.96 0.065 0.08 0.94 9c) 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4	1 19.94 20.07 1 18.66 4) =		(87 (88 (89 (90 8	77) 33) 9) 0) 1)
Mean int (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m= Mean int (90)m= 1 Mean int (92)m= 1	1 0.9 ternal tern 9.97 20. ature duri 20.06 20. on factor fr 1 0.9 ternal tern 8.68 18. ternal tern 9.17 19.	peratur peratur peratur peratur peratur peratur peratur peratur peratur	e in the second of the second	Apr 0.92 ving are 20.71 eriods ir 20.08 est of de 0.9 he rest 19.75 the wh	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35	f dw 2 h2, h2,	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5 T2 (fo 0.08	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 collow ste 20.09 LA × T1 20.43	0.4 7 in T 21 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0	8 0.78 (able 9c) 1 20.9 0, Th2 (°C) 9 0.66 to 7 in T 09 20.0 fLA) × 43 20.3	95 2 C) 99 2 8 (able 9 15 1 fLA T2	0.96 0.96 0.065 0.08 0.94 9c) 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4	1 19.94 20.07 1 18.66 4) =		(87 (88 (89 (90 8	77) 33) 9) 0) 1)
Mean inf (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m=	1 0.9 ternal tem 9.97 20. ature duri 20.06 20. on factor fi 1 0.9 ternal tem 8.68 18. ternal tem 9.17 19. djustment	perature 19 0.1 19 0.1 19 0.1 19 0.1 19 perature 37 19 to the m	e in the interval of the inter	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 he rest 19.75 the wh 20.11 internal	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35 tempe	follo 2 f dw 2 h2, h2, h2, colored a co	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5 T2 (fc 0.08 g) = fl 0.42 tre fro	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 ollow ste 20.09 LA × T1 20.43 m Table	0.47 in T 21 22 20.0 20.0 20.0 20.0 20.0 20.0 20.	8 0.78 (able 9c) 1 20.9 0, Th2 (°C) 9 0.66 to 7 in T 09 20.0 - fLA) × 43 20.3 where ap	205 2 C) D)	0.96 20.65 20.08 20.094 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4	1 19.94 20.07 1 18.66 4) =		(87 (88 (89 (90 8 (91	77) 33) 99) 11)
Mean int (87)m= 1 Tempera (88)m= 2 Utilisation (89)m= 1 Mean int (90)m= 1 Mean int (92)m= 1 Apply ac (93)m= 1	1 0.9 ternal tern 9.97 20. ature duri 20.06 20. on factor fr 1 0.9 ternal tern 8.68 18. ternal tern 9.17 19. djustment 9.17 19.	perature 19 0. perature 19 0. perature 19 19 19 19 19 19 19 19 19 19 19 19 19	e in the second of the second	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 he rest 19.75 the wh 20.11 internal	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35 tempe	follo 2 f dw 2 h2, h2, h2, colored a co	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5 T2 (fc 0.08 g) = fl 0.42 tre fro	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 ollow ste 20.09 LA × T1 20.43 m Table	0.47 in T 21 22 20.0 20.0 20.0 20.0 20.0 20.0 20.	8 0.78 (able 9c) 1 20.9 0, Th2 (°C) 9 0.66 to 7 in T 09 20.0 - fLA) × 43 20.3 where ap	205 2 C) D)	0.96 20.65 20.08 20.094 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4	1 19.94 20.07 1 18.66 4) =		(87 (88 (89 (90 8 (91	77) 33) 99) 11)
Mean inf (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m=	1 0.9 ternal tem 9.97 20. ature duri 20.06 20. on factor fi 1 0.9 ternal tem 8.68 18. ternal tem 9.17 19. djustment 9.17 19. e heating	perature 19 0.1 19 0.1 19 0.1 19 0.1 19 perature 19 19 19 19 19 19 19 19 19 19 19 19 19	e in the interest of the inter	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 he rest 19.75 the wh 20.11 internal 20.11	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35 tempe 20.35	follo 2 f dw 2 h2, h2, h2, colored a co	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.05 T2 (fc 0.08 g) = fl 0.42 tre fro 0.42	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 ollow ste 20.09 LA × T1 20.43 m Table 20.43	0.4 7 in T 21 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.4 20.4	8 0.78 8 0.78 8 0.78 9 20.6 9 0.66 1 to 7 in T 1	5 (C) 09 2 09 2 09 2 09 1 09 1 09 1 09 1 09 1 09 1 09 1 09 1	0.96 20.65 20.08 20.094 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4) 19.54	1 19.94 20.07 1 18.66 4) =	0.38	(87 (88 (89 (90 8 (91	77) 33) 99) 11)
Mean int (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m=	1 0.9 ternal tem 9.97 20. ature duri 20.06 20. on factor fr 1 0.9 ternal tem 8.68 18. ternal tem 9.17 19. djustment 9.17 19. c heating o the mean	perature 12 20 20 20 20 20 20 20 20 20 20 20 20 20	e in the control of t	Apr 0.92 ving are 20.71 eriods in 20.08 est of do 0.9 he rest 19.75 the wh 20.11 internal 20.11	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35 tempe 20.35	follo 2 f dw 2 h2, h2, h2, colored a co	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.05 T2 (fc 0.08 g) = fl 0.42 tre fro 0.42	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 ollow ste 20.09 LA × T1 20.43 m Table 20.43	0.4 7 in T 21 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.4 20.4	8 0.78 8 0.78 8 0.78 9 20.6 9 0.66 1 to 7 in T 1	5 (C) 09 2 09 2 09 2 09 1 09 1 09 1 09 1 09 1 09 1 09 1 09 1	0.96 20.65 20.08 20.094 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4) 19.54	1 19.94 20.07 1 18.66 4) =	0.38	(87 (88 (89 (90 8 (91	77) 33) 99) 11)
Mean inf (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m= 1 Mean inf (90)m= 1 Mean inf (92)m= 1 Apply ac (93)m= 1 8. Space Set Ti to the utilis	ternal tem 9.97 20. ature duri 20.06 20. on factor for ternal tem 8.68 18. ternal tem 9.17 19. djustment 9.17 19. c heating of the mean sation factor	perature 19 19 19 19 19 19 19 19 19 19 19 19 19	e in the second of the second	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 he rest 19.75 the wh 20.11 internal 20.11	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35 tempe 20.35	follo 2 f dw 2 f dw 2 gratue 2 gratue 2	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5 T2 (fc 0.08 g) = fl 0.42 are fro 0.42	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 collow ste 20.09 LA × T1 20.43 m Table 20.43 ep 11 of	0.4 7 in T 21 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 20.4 Table	8 0.78 8 0.78 8 0.78 9 20.0 9 0.66 10 7 in T 10 20.0 - fLA) × 43 20.3 where ap 43 20.3	5 (20) 09 2 8 (20) 8 (20) 6 1 6 1 6 1 7 2 9 2 9 2 9 2 9 2 9 1 9 2 9 1 9 2 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1	20.65 20.08 20.094 20.094 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4 19.54 19.54	1 19.94 20.07 1 18.66 4) = 19.14 19.14 d re-ca	0.34	(87 (88 (89 (90 8 (91	77) 33) 99) 11)
Mean int (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m=	ternal tem 9.97 20. ature duri 20.06 20. on factor from ternal tem 8.68 18. ternal tem 9.17 19. djustment 9.17 19. c heating of the mean station fact Jan F	perature 19 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.	e in the second of the second	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 he rest 19.75 the wh 20.11 internal 20.11 experiods ir Apr	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35 tempe 20.35 re obtainable 9a	follo 2 f dw 2 f dw 2 gratue 2 gratue 2	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5 T2 (fc 0.08 g) = fl 0.42 are fro 0.42	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 collow ste 20.09 LA × T1 20.43 m Table 20.43 ep 11 of	0.4 7 in T 21 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 20.4 Table	8 0.78 8 0.78 8 0.78 9 20.0 9 0.66 10 7 in T 10 20.0 - fLA) × 43 20.3 where ap 43 20.3	5 (20) 09 2 8 (20) 8 (20) 6 1 6 1 6 1 7 2 9 2 9 2 9 2 9 2 9 1 9 2 9 1 9 2 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1	20.65 20.08 20.094 20.094 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4 19.54 19.54	1 19.94 20.07 1 18.66 4) = 19.14 19.14 d re-ca	0.34	(87 (88 (89 (90 8 (91	77) 33) 99) 11)
Mean inf (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m= 1 Mean inf (90)m= 1 Mean inf (92)m= 1 Apply ac (93)m= 1 8. Space Set Ti to the utilis	ternal terms at terms	perature 19 19 19 19 19 19 19 19 19 19 19 19 19	e in the second of the second	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 he rest 19.75 the wh 20.11 internal 20.11 apperaturesing Tal	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35 tempe 20.35 re obtai able 9a May	follo 2 f dw 2 f dw 2 f dw 2 cratu 2	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5 T2 (fc 0.08 g) = fl 0.42 are fro 0.42 Jun	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 collow ste 20.09 LA × T1 20.43 m Table 20.43 ep 11 of Jul	0.4 7 in T 21 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.4 20.4 Table Au	8 0.78 8 0.78 8 0.78 9 20.9 9 0.60 1	5 (20) 25 2 26 2 27 2 28 (20) 29 2 20 2 20 2 20 2 20 2 20 2 20 2 20 2	0.96 20.65 20.08 20.094 9.68 = Liv 20.05 iiate 20.05	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4 19.54 19.54 Nov	1 19.94 20.07 1 18.66 4) = 19.14 19.14 d re-ca Dec	0.34	(87 (88 (89 (90 8 (91 (92	77) 33) 9) 9) 11) 22) 33)

Useful gains, hmGm , W = (94)m x (84)m	_	ı	ı	1	(0.7)
(95)m= 484.28 555.29 630.85 675.25 608.5 430.81 286.8 300.43 447.14	507.99	472.33	459.88		(95)
Monthly average external temperature from Table 8	100	7.4	1 40	1	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W = $[(39)m \times [(93)m - (96)n]]$ (97)m= 1156.72 1122.14 1020.98 854.13 656.96 436.8 287.44 301.72 473.89		950.55	1148.36		(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (97)m]$		<u> </u>	1140.30		(01)
Space fleating requirement for each month, kwin/month = $0.024 \times [(97)\text{m} - (98)\text{m}] = 500.3 380.92 290.26 128.79 36.06 0 0 0 0$	156.27	344.32	512.22		
Total per year			L	2349.14	(98)
	ii (KVVII) yeai) = Odin(S	0)15,912 —		╡```
Space heating requirement in kWh/m²/year				31.03	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)					
Space heating:			1		٦
Fraction of space heat from secondary/supplementary system				0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$	=			1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (204)] = (202) \times [1 - (204)] = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (20$	- (203)] =			1	(204)
Efficiency of main space heating system 1				93.5	(206)
Efficiency of secondary/supplementary heating system, %				0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct	Nov	Dec	kWh/ye	– ar
Space heating requirement (calculated above)					
500.3 380.92 290.26 128.79 36.06 0 0 0	156.27	344.32	512.22		
$(211)m = \{[(98)m \times (204)]\} \times 100 \div (206)$					(211)
535.08 407.41 310.44 137.74 38.57 0 0 0 0	167.13	368.26	547.83		, ,
Total (kWh/y	ear) =Sum(2	211),15,101	<u></u>	2512.45	(211)
Space heating fuel (secondary), kWh/month			!		_
$= \{[(98)m \times (201)]\} \times 100 \div (208)$					
(215)m= 0 0 0 0 0 0 0 0 0	0	0	0		
Total (kWh/y	ear) =Sum(2	215) _{15,101}		0	(215)
Water heating			'		
Output from water heater (calculated above)	_	ī		I	
194.45 171.4 180.03 161.43 158.22 141.42 135.85 149.02 148.74	167.39	176.95	189.78		_
Efficiency of water heater	_		,	79.8	(216)
(217)m= 87.23 86.88 86.08 84.22 81.59 79.8 79.8 79.8 79.8	84.63	86.56	87.33		(217)
Fuel for water heating, kWh/month					
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 222.92 197.27 209.14 191.67 193.92 177.21 170.24 186.74 186.39 $	197.78	204.42	217.3		
Total = Sum(201.12		2355.02	(219)
Annual totals		Wh/yeaı	•	kWh/yea	
Space heating fuel used, main system 1	K.	vvii/y c ai		2512.45	7
Water heating fuel used					┪
· ·				2355.02	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)

boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				331.17	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	542.69	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	508.68	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1051.37	(265)

0.519

0.519

sum of (265)...(271) =

(231) x

(232) x

TER = 16.67 (273)

Electricity for pumps, fans and electric keep-hot

Electricity for lighting

Total CO2, kg/year

(267)

(268)

(272)

38.93

171.88

1262.18

			User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 20	12						Versio	on: 1.0.4.26	
		P	roperty	Address	: C85_B	e Lean				
Address :										
Overall dwelling dimer	nsions:		•	(0)					\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	, ,
Ground floor					(1a) x			(2a) =	205.52	°) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1n	1)	73.4	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	205.52	(5)
2. Ventilation rate:										
Number of chimneys	heating	heating	· - –		7 ₌ Γ		x	40 =	m³ per hou	ır (6a
•			╛╘		╛╘			20 -		=
·		0]	0] <u> </u>	0			0	(6b
	1S				Ĺ	0			0	(7a
Number of passive vents					L	0	X	10 =	0	(7b
Number of flueless gas fir	es					0	X	40 =	0	(70
								Air ch	anges ner h	nur.
Infiltration due to objection	in fluor and fans – (3a)+(6b)+(7	a)+(7b)+(70) -			_			_
	Area(m²) Av. Height(m) Volum		0	(8)						
	Stroma Number: Stroma Number: Software Version: Version: 1.0.4.2		0	(9)						
Additional infiltration							[(9)	-1]x0.1 =	0	(10
					-	ruction			0	(11
		sponding to	the great	ter wall are	a (after					
		iled) or 0.	1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ent	er 0.05, else enter 0								0	(13
· ·	and doors draught s	tripped							0	(14
Window infiltration				•	,	-			0	(15
Infiltration rate									0	(16
•	•		•	•	•	netre of e	envelope	area		(17
•						is beina u	sed		0.15	(18
Number of sides sheltered				y	,				2	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.13	(21
Infiltration rate modified for	or monthly wind spee	d						,	•	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								•	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m – (22)\m ÷ 4									
	·	0.95	0.95	0.92	1	1.08	1.12	1.18		
,						1			l	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effec		-	rate for t	he appli	cable ca	se	!					, 	
If mechanica			l' N (0	01.) (00	\ - /	/	15// (1	. (00)	\ (00.)			0.5	(23a
If exhaust air he) = (23a)			0.5	(23b
If balanced with		•	•	_								76.5	(230
a) If balance						- ` ` 	- ` ` - 	ŕ	r ´ `		``	i ÷ 100] I	(0.4-
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	J	(24a
b) If balance							r Ó Ì	i `	r Ó - Ò	 		1	(O.4h
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole he if (22b)m				•					5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural v if (22b)m				•	•				0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m = 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losses	and he	eat loss	paramete	er:							_	_	_
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Doors Type 1					2.5	x	1.3	=	3.25				(26)
Doo <mark>rs Ty</mark> pe 2					2.5	X	1	<u></u>	2.5	Ħ			(26)
Windows Type	1				1.9	x1.	/[1/(1.3)+	0.04] =	2.35	Ħ			(27)
Windows Type	2				4.1	x1.	/[1/(1.3)+	0.04] =	5.07	5			(27)
Windows Type	3				2.6	x1.	/[1/(1.3)+	0.04] =	3.21	=			(27)
Windows Type	4				5.1	x1.	/[1/(1.3)+	0.04] =	6.3	=			(27)
Windows Type	5				2.6	x ₁ ,	/[1/(1.3)+	0.04] =	3.21	Ħ			(27)
Walls	83.1	6	26.5		56.66	x	0.15	i	8.5	=		–	(29)
Total area of el					83.16	=							(31)
* for windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	(-)
** include the area	s on both	sides of in	nternal wali	ls and part	titions								
Fabric heat los		•	U)				(26)(30)) + (32) =				40.82	(33)
Heat capacity (`	,						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	-								tive Value			250	(35)
For design assess can be used instead				constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	,	,			•	<						4.16	(36)
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			44.98	(37)
Ventilation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 18.99	18.78	18.56	17.48	17.26	16.18	16.18	15.97	16.62	17.26	17.7	18.13	1	(38)
Heat transfer c	oefficier	nt, W/K			•	•	•	(39)m	= (37) + (37)	38)m	•	•	
(39)m= 63.97	63.76	63.54	62.46	62.24	61.16	61.16	60.95	61.59	62.24	62.67	63.11]	
Stroma FSAP 2012	2 Version:	1.0.4.26 ((SAP 9.92)	- http://wv	ww.stroma	.com		•	Average =	Sum(39) ₁	12 /12=	62.4	Page 2 (39)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.87	0.87	0.85	0.85	0.83	0.83	0.83	0.84	0.85	0.85	0.86		
						l	l		Average =	Sum(40) ₁	12 /12=	0.85	(40)
Number of day	·	nth (Tab	le 1a)		ı			ı					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		33		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.44		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x							
(44)m= 98.38	94.8	91.23	87.65	84.07	80.49	80.49	84.07	87.65	91.23	94.8	98.38		
						!				m(44) ₁₁₂ =		1073.24	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	ables 1b, 1	c, 1d)		
(45)m= 145.9	127.6	131.67	114.8	110.15	95.05	88.08	101.07	102.28	119.2	130.11	141.29		
If ins <mark>tantane</mark> ous v	vator hoati	ng at naint	of use (no	hot water	r etorago)	ontor () in	haves (46		Total = Su	m(45) ₁₁₂ =		1407.19	(45)
				-		_							(40)
(46)m= 21.88 Water storage	19.14 10SS	19.75	17.22	16.52	14.26	13.21	15.16	15.34	17.88	19.52	21.19		(46)
Storage volum		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h													, ,
Otherwise if n	•			•			` '	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-								02		(51)
If community h	•			0 2 (, o, ac	-97				0.	02		(01)
Volume factor	_									1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	om Table	<u>-</u> -							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	y factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combiless	olouloto d	for oach	month /	(61)m	(CO) + 20	SE (41)	١,,,,						
Combi loss of (61)m= 0	alculated 0	or each	month (01)m =	(6U) ÷ 30	05 × (41)	0	T 0	0	0	0	1	(61)
(3)							<u> </u>	ļ			<u> </u>] · (59)m + (61)m	(0.)
(62)m= 201.1	`	186.95	168.29	165.43	148.54	143.35	156.35		174.47	183.6	196.57]	(62)
Solar DHW inpu]	(02)
(add addition									ii ooniinba	ion to wat	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	water hea	ter				!	l		<u>!</u>	Į	<u>!</u>	1	
(64)m= 201.1		186.95	168.29	165.43	148.54	143.35	156.35	155.77	174.47	183.6	196.57	1	
							Ou	tput from w	ater heate	r (annual)	112	2058.03	(64)
Heat gains fi	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8	x [(46)m	+ (57)m	+ (59)m	 1]	_
(65)m= 92.73	1	88	80.96	80.85	74.4	73.51	77.83	76.8	83.85	86.06	91.2]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ins (Table	e 5), Wat	ts										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 116.2	9 116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29		(66)
Ligh <mark>ting g</mark> air	ıs (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m= 18.28	3 16.24	13.21	10	7.47	6.31	6.82	8.86	11.9	15.1	17.63	18.79		(67)
Appliances g	gains (ca <mark>lc</mark>	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			-	
(68)m= 205.1	207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05		(68)
Cooking gair	ns (calcula	ited in A	opendix	L, equat	ion L15	or L15a)), also s	see Table	5		-	-	
(69)m= 34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63		(69)
Pumps and t	ans gains	(Table 5	āa)									_	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)							_	
(71)m= -93.0	3 -93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03]	(71)
Water heating	ng gains (T	able 5)										_	
(72)m= 124.6	4 122.57	118.28	112.45	108.66	103.33	98.8	104.61	106.67	112.71	119.52	122.58]	(72)
Total intern	al gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	_	
(73)m= 405.9	1 403.93	391.24	370.78	350.06	330.02	316.94	322.67	333.13	353.79	377.54	395.31		(73)
6. Solar gai													
Solar gains ar		ŭ		Table 6a			itions to d		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
East 0.9							. —				_		7(70)
		X	2.0		_	19.64	X	0.53		0.8	=	30.01	(76)
		<u> </u>	2.0			19.64		0.53		0.8	=	30.01	(76)
_		X	2.0			38.42]	0.53		0.8	_ =	58.7	(76)
		x	2.0		-	38.42		0.53		0.8	_ =	58.7	(76)
East 0.9	0.77	Х	2.0	o	x6	33.27	X	0.53	x	0.8	=	96.68	(76)

	_						ı						_
East	0.9x	0.77	X	2.6	X	63.27	X	0.53	X	0.8	=	96.68	(76)
East	0.9x	0.77	X	2.6	x	92.28	X	0.53	X	0.8	=	141	(76)
East	0.9x	0.77	X	2.6	X	92.28	X	0.53	X	0.8	=	141	(76)
East	0.9x	0.77	X	2.6	x	113.09	x	0.53	X	0.8	=	172.8	(76)
East	0.9x	0.77	X	2.6	X	113.09	X	0.53	X	0.8	=	172.8	(76)
East	0.9x	0.77	X	2.6	X	115.77	x	0.53	X	0.8	=	176.89	(76)
East	0.9x	0.77	X	2.6	x	115.77	x	0.53	X	0.8	=	176.89	(76)
East	0.9x	0.77	X	2.6	x	110.22	x	0.53	X	0.8	=	168.41	(76)
East	0.9x	0.77	X	2.6	X	110.22	x	0.53	X	0.8	=	168.41	(76)
East	0.9x	0.77	X	2.6	x	94.68	x	0.53	X	0.8	=	144.66	(76)
East	0.9x	0.77	X	2.6	x	94.68	x	0.53	X	0.8	=	144.66	(76)
East	0.9x	0.77	X	2.6	x	73.59	x	0.53	X	0.8	=	112.44	(76)
East	0.9x	0.77	x	2.6	x	73.59	x	0.53	x	0.8	=	112.44	(76)
East	0.9x	0.77	x	2.6	x	45.59	x	0.53	x	0.8	=	69.66	(76)
East	0.9x	0.77	X	2.6	x	45.59	x	0.53	X	0.8	=	69.66	(76)
East	0.9x	0.77	x	2.6	x	24.49	x	0.53	X	0.8	=	37.42	(76)
East	0.9x	0.77	x	2.6	x	24.49	x	0.53	x	0.8	=	37.42	(76)
East	0.9x	0.77	X	2.6	X	16.15	X	0.53	X	0.8	=	24.68	(76)
East	0.9x	0.77	x	2.6	x	16.15	×	0.53	x	0.8	=	24.68	(76)
South	0.9x	0.77	x	1.9	х	46.75	×	0.53	x	0.7	=	22.84	(78)
South	0.9x	0.77	x	1.9	x	76.57	x	0.53	x	0.7	=	37.4	(78)
South	0.9x	0.77	x	1.9	х	97.53	Х	0.53	x	0.7	=	47.64	(78)
South	0.9x	0.77	x	1.9	x	110.23	X	0.53	x	0.7	=	53.85	(78)
South	0.9x	0.77	x	1.9	х	114.87	x	0.53	x	0.7	=	56.11	(78)
South	0.9x	0.77	X	1.9	x	110.55	x	0.53	X	0.7	=	54	(78)
South	0.9x	0.77	X	1.9	x	108.01	x	0.53	X	0.7	=	52.76	(78)
South	0.9x	0.77	X	1.9	x	104.89	x	0.53	X	0.7	=	51.24	(78)
South	0.9x	0.77	x	1.9	x	101.89	x	0.53	X	0.7	=	49.77	(78)
South	0.9x	0.77	x	1.9	x	82.59	x	0.53	x	0.7	=	40.34	(78)
South	0.9x	0.77	x	1.9	x	55.42	x	0.53	x	0.7	=	27.07	(78)
South	0.9x	0.77	x	1.9	x	40.4	x	0.53	X	0.7	=	19.73	(78)
West	0.9x	0.77	x	4.1	x	19.64	x	0.53	X	0.8	=	23.66	(80)
West	0.9x	0.77	x	5.1	x	19.64	x	0.53	X	0.8	=	29.43	(80)
West	0.9x	0.77	X	4.1	x	38.42	x	0.53	X	0.8	=	46.29	(80)
West	0.9x	0.77	X	5.1	x	38.42	x	0.53	X	0.8	=	57.57	(80)
West	0.9x	0.77	x	4.1	x	63.27	x	0.53	x	0.8	=	76.23	(80)
West	0.9x	0.77	x	5.1	x	63.27	x	0.53	x	0.8	j =	94.82	(80)
West	0.9x	0.77	x	4.1	x	92.28	x	0.53	x	0.8	j =	111.17	(80)
West	0.9x	0.77	x	5.1	x	92.28	x	0.53	x	0.8	j =	138.29	(80)
West	0.9x	0.77	x	4.1	x	113.09	x	0.53	x	0.8	j =	136.24	(80)
West	0.9x	0.77	x	5.1	x	113.09	x	0.53	x	0.8	j =	169.47	(80)
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	_		_									_					
West	0.9x	0.77	X	4.1	I	X	1	15.77	X	0.5	3	X	0.8		=	139.47	(80)
West	0.9x	0.77	x	5.1	I	X	1	15.77	X	0.5	3	x	0.8		=	173.49	(80)
West	0.9x	0.77	X	4.1	I	x	1	10.22	X	0.5	3	X	0.8		=	132.78	(80)
West	0.9x	0.77	X	5.1	I	x	1	10.22	X	0.5	3	X	0.8		=	165.17	(80)
West	0.9x	0.77	X	4.1	1	x	9	4.68	X	0.5	3	x	0.8		=	114.06	(80)
West	0.9x	0.77	X	5.1	I	x	9	4.68	X	0.5	3	x	0.8		=	141.88	(80)
West	0.9x	0.77	x	4.1	l	x	7	3.59	x	0.5	3	x	0.8		=	88.65	(80)
West	0.9x	0.77	x	5.1	ı	x	7	3.59	x	0.5	3	x	0.8		=	110.28	(80)
West	0.9x	0.77	X	4.1	1	x	4	5.59	X	0.5	3	x	0.8		=	54.92	(80)
West	0.9x	0.77	X	5.1	1	x	4	5.59	X	0.5	3	x	0.8		=	68.32	(80)
West	0.9x	0.77	X	4.1	1	x	2	4.49	X	0.5	3	x	0.8		=	29.5	(80)
West	0.9x	0.77	X	5.1	1	x	2	4.49	X	0.5	3	x	0.8		=	36.7	(80)
West	0.9x	0.77	x	4.1	1	x	1	6.15	X	0.5	3	x	0.8		=	19.46	(80)
West	0.9x	0.77	x	5.1	I	x	1	6.15	X	0.5	3	x	0.8		=	24.2	(80)
Solar g	ains in	watts, calcu	lated	for each	n mont	h			(83)m	= Sum(7	4)m	(82)m	_	_			
(83)m=	135.95	258.67 41	2.04	585.3	707.43	7.	20.74	687.52	596.	49 473	3.58	302.9	168.11	112	.75		(83)
Total ga	ains – ir	nternal and	solar	(84)m =	(73)m	+ (83)m	, watts									
(84)m=	541.86	662.6 80	3.28	956.08	1057.49	9 10	50.75	1004.47	919.	.15 80	6.7	656.68	545.65	508	.06		(84)
7. Mea	an inter	nal tempera	ture (heating	seaso	n)											
Tempe	erature	during heat	ing pe	eriods in	the liv	ring	area f	rom Tal	ole 9.	Th1 (°	<u>C)</u>					21	(85)
									,	/	Ο,						(/
Utilisa	tion fac	tor for gains	for li	ving are	a, h1,r	n (s	ee Ta		,,,,	,						2.	,,,,,
Util <mark>isa</mark>	tion fac Jan		for li	ving are Apr	a, h1,r May		ee Ta Jun		Au		Sep	Oct	Nov	D	ec		(23)
Utilisa (86)m=		Feb N	T		$\overline{}$			ble 9a)		ıg S		Oct 0.86	Nov 0.98	D 1			(86)
(86)m=	Jan 0.99	Feb / N	Mar .92	Apr 0.75	May 0.54		Jun 0.37	Jul 0.27	Au 0.3	ug S	Sep 52	_	_	+			
(86)m=	Jan 0.99	Feb N 0.98 0. I temperatur	Mar .92	Apr 0.75	May 0.54		Jun 0.37	Jul 0.27	Au 0.3	ug S 3 0.	Sep 52	_	0.98	+			
(86)m= Mean (87)m= [Jan 0.99 interna 20.29	Feb M 0.98 0. 1 temperatur 20.49 20	Mar .92 re in li	Apr 0.75 iving are 20.94	0.54 ea T1 (20.99	follo	Jun 0.37 ow ste 21	Jul 0.27 ps 3 to 7	0.37 in T	ug S 3 0.	Sep 52 1) 21	0.86	0.98	1			(86)
(86)m= Mean (87)m= Tempe	Jan 0.99 interna 20.29 erature	Feb 0.98 0.00 0.98 0.00 0.00 0.00 0.00 0.00	Mar .92 re in li 0.75	Apr 0.75 iving are 20.94 eriods in	0.54 ea T1 (20.99	follo	Jun 0.37 ow ste 21 velling	Jul 0.27 ps 3 to 7 21 from Ta	Au 0.37 in T 22	able 90 1 2 2 2 3 7 Th2 (1	Sep 552) 21	20.89	0.98	20.:	25		(86)
(86)m= Mean (87)m= Tempe (88)m=	Jan 0.99 interna 20.29 erature 20.19	Feb 0.98 0.00 0.98 0.00 0.00 0.00 0.00 0.00	Mar .92 re in li 0.75 ing pe	Apr 0.75 iving are 20.94 eriods in 20.21	0.54 ea T1 (20.99 rest o	follo	Jun 0.37 ow ste 21 velling 20.22	Jul 0.27 ps 3 to 7 21 from Ta 20.22	0.37 in T 21 22 20.3	able 90 1 2 2 2 3 7 Th2 (1	Sep 552) 21	0.86	0.98	1	25		(86)
(86)m=	Jan 0.99 interna 20.29 erature 20.19 tion fac	Feb 0.98 0.00 0.98 0.00 0.00 0.00 0.00 0.00	Mar 92 re in li 0.75 ing pe 0.2	Apr 0.75 iving are 20.94 eriods in 20.21 est of dv	May 0.54 ea T1 (20.99 rest o 20.21 welling	follo	Jun 0.37 ow ste 21 velling 20.22 ,m (se	Jul 0.27 ps 3 to 7 21 from Ta 20.22 pe Table	0.37 in T 21 able 9 20.2 9a)	able 90 0, Th2 (23	Sep	20.89	0.98 20.55 20.21	20	25		(86) (87) (88)
(86)m= Mean (87)m= Tempe (88)m=	Jan 0.99 interna 20.29 erature 20.19	Feb 0.98 0.00 0.98 0.00 0.00 0.00 0.00 0.00	Mar .92 re in li 0.75 ing pe	Apr 0.75 iving are 20.94 eriods in 20.21	0.54 ea T1 (20.99 rest o	follo	Jun 0.37 ow ste 21 velling 20.22	Jul 0.27 ps 3 to 7 21 from Ta 20.22	0.37 in T 21 22 20.3	able 90 0, Th2 (23	Sep 552) 21	20.89	0.98	20.:	25		(86)
(86)m=	Jan 0.99 interna 20.29 erature 20.19 tion fac 0.99 interna	Feb 0.98 0.00 0.98 0.00 0.00 0.00 0.00 0.00	mar 92 re in li 0.75 ing pe 0.2 s for re 0.9	Apr 0.75 iving are 20.94 eriods in 20.21 est of dv 0.71	May 0.54 ea T1 (20.99 rest o 20.21 welling 0.5	follo	Jun 0.37 ow ste 21 velling 20.22 ,m (se 0.33	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.22 ee Table 0.22	Au 0.3 7 in T 21 able 9 20.3 9a) 0.2	ug S 3 0. fable 9c 1 2 0, Th2 (23 20 5 0.	Sep 552 1 1 2 1 2 1 2 2 2	0.86 20.89 20.21 0.82	0.98 20.55 20.21	20	25		(86) (87) (88) (89)
(86)m=	Jan 0.99 interna 20.29 erature 20.19 tion fac 0.99	Feb N 0.98 0. I temperatur 20.49 20 during heat 20.19 20 tor for gains 0.97 00 I temperatur	mar 92 re in li 0.75 ing pe 0.2 s for re 0.9	Apr 0.75 iving are 20.94 eriods in 20.21 est of dv 0.71	May 0.54 ea T1 (20.99 rest o 20.21 welling 0.5	f dw 2	Jun 0.37 ow ste 21 velling 20.22 ,m (se 0.33	ble 9a) Jul 0.27 ps 3 to 7 21 from Ta 20.22 ee Table 0.22	Au 0.3 7 in T 21 able 9 20.3 9a) 0.2	ug S 3 0. able 90 7, Th2 (23 20 5 0. to 7 in	3ep 52 21 21 22 47 Table	0.86 20.89 20.21 0.82 9c) 20.1	0.98 20.55 20.21 0.97	20	25 29 99		(86) (87) (88)
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(86)m= Mean (87)m= Tempe (88)m= Utilisa (89)m= Mean (90)m=	Jan 0.99 interna 20.29 erature 20.19 tion fac 0.99 interna 19.24	Feb 0.98 0.00 0.98 0.00 0.00 0.00 0.00 0.00	Mar .92 re in li 0.75 ing per 0.2 s for re 0.9	Apr 0.75 iving are 20.94 eriods in 20.21 est of dv 0.71 he rest of	May 0.54 ea T1 (20.99 o rest of 20.21 welling 0.5 of dwe 20.21	follo	Jun 0.37 ow ste 21 velling 20.22 ,m (se 0.33 T2 (fo	Jul 0.27 ps 3 to 7 21 from Ta 20.22 pe Table 0.22 pollow ste 20.22	Au 0.3 7 in T 22 able 9 20.2 9a) 0.2 eps 3	able 90 able 90 7, Th2 (123 20) 5 0. to 7 in 23 20	Sep 52)	0.86 20.89 20.21 0.82 9c) 20.1	0.98 20.55 20.21 0.97	20	25 29 99		(86) (87) (88) (89)
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(86)m= Mean (87)m= Tempe (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti	Jan 0.99 interna 20.29 erature 20.19 tion fac 0.99 interna 19.24 interna 19.63 adjustn 19.63 to the r	Feb 0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.98	mar 1.92 re in li 0.75 ing per 0.2 s for re 0.9 re in t 9.9 re (for per 0.21 mean 0.21 ment al tem	Apr 0.75 iving are 20.94 eriods in 20.21 est of dv 0.71 he rest of 20.15 r the who 20.44 internal 20.44	May 0.54 ea T1 (20.99 n rest of 20.21 welling 0.5 of dwe 20.21 cole dw 20.5 temper 20.5	f dw 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Jun 0.37 ow ste 21 velling 20.22 m (se 0.33 T2 (fc 20.22 g) = fl 20.51 ure fro 20.51	Jul 0.27 ps 3 to 7 21 from Ta 20.22 ee Table 0.22 collow ste 20.22 A × T1 20.51 m Table 20.51	Au 0.3 7 in T 2- able 9 20.2 9a) 0.2 eps 3 20.2 + (1 - 20.9 20.9	Jug S 3 0. Fable 90 2 20 5 0. Th2 (10 23 20 5 1 20 4 fLA) > 5 1 20 6 where a 5 1 20	36ep 52 52 52 52 52 52 52 5	0.86 20.89 20.21 0.82 9c) 20.1 A = Liv	0.98 20.55 20.21 0.97 19.63 ing area ÷ 1 19.97	20 20 20 19 19	225 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.37	(86) (87) (88) (89) (90) (91)
(86)m= Mean (87)m= Tempe (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti	Jan 0.99 interna 20.29 erature 20.19 tion fac 0.99 interna 19.24 interna 19.63 adjustn 19.63 to the r lisation	Feb 0.98 0.98 0.98 0.98 0.98 0.98 0.90 0.90	re in to 10.21 mean ains unated	Apr 0.75 iving are 20.94 eriods in 20.21 est of dv 0.71 he rest of 20.15 r the who 20.44 internal 20.44 enperaturusing Ta	May 0.54 ea T1 (20.99 n rest of 20.21 welling 0.5 of dwe 20.21 cole dw 20.5 tempe 20.5 e obta ble 9a	following following for the following following for the following following following for the following following following for the following foll	Jun 0.37 ow ste 21 velling 20.22 m (se 0.33 T2 (fc 20.22 g) = fl 20.51 ure fro 20.51	Jul 0.27 ps 3 to 7 21 from Ta 20.22 pe Table 0.22 pllow ste 20.22 A × T1 20.51 m Table 20.51	Au 0.3 7 in T 2 able 9 20.3 9a) 0.2 eps 3 20.3 + (1 - 20.9 Table	Jg S 3 0. able 90 5 7 1 20 5 0. to 7 in 23 20 - fLA) > where a 51 20 e 9b, so	36ep 37 37 37 37 37 37 37 3	0.86 20.89 20.21 0.82 9c) 20.1 A = Liv 20.39 Driate 20.39	0.98 20.55 20.21 0.97 19.63 ring area ÷ 1 19.97 19.97	20 20 20 19 19 19 19 19	25 2 9 9 59	0.37	(86) (87) (88) (89) (90) (91)
Mean (87)m= Tempe (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the uti	Jan 0.99 interna 20.29 erature 20.19 tion fac 0.99 interna 19.24 interna 19.63 adjustn 19.63 to the r lisation Jan	Feb 0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.90 0.90	re in to the second of the sec	Apr 0.75 iving are 20.94 eriods in 20.21 est of dv 0.71 he rest of 20.15 r the who 20.44 internal 20.44 enperaturusing Ta Apr	May 0.54 ea T1 (20.99 n rest of 20.21 welling 0.5 of dwe 20.21 cole dw 20.5 temper 20.5	following following for the following following for the following following following for the following following following for the following foll	Jun 0.37 ow ste 21 velling 20.22 m (se 0.33 T2 (fc 20.22 g) = fl 20.51 ure fro 20.51	Jul 0.27 ps 3 to 7 21 from Ta 20.22 ee Table 0.22 collow ste 20.22 A × T1 20.51 m Table 20.51	Au 0.3 7 in T 2- able 9 20.2 9a) 0.2 eps 3 20.2 + (1 - 20.9 20.9	Jg S 3 0. able 90 5 7 1 20 5 0. to 7 in 23 20 - fLA) > where a 51 20 e 9b, so	36ep 52 52 52 52 52 52 52 5	0.86 20.89 20.21 0.82 9c) 20.1 A = Liv	0.98 20.55 20.21 0.97 19.63 ring area ÷ 1 19.97 19.97	20 20 20 19 19 19 19 19	225 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.37	(86) (87) (88) (89) (90) (91)
Mean (87)m= Tempe (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the uti	Jan 0.99 interna 20.29 erature 20.19 tion fac 0.99 interna 19.24 interna 19.63 adjustn 19.63 to the r lisation Jan	Feb N 0.98 0.98 0.98 0.98 0.99 0.99 0.99 0.99	re in to the second of the sec	Apr 0.75 iving are 20.94 eriods in 20.21 est of dv 0.71 he rest of 20.15 r the who 20.44 internal 20.44 enperaturusing Ta Apr	May 0.54 ea T1 (20.99 n rest of 20.21 welling 0.5 of dwe 20.21 cole dw 20.5 tempe 20.5 e obta ble 9a	f dw 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Jun 0.37 ow ste 21 velling 20.22 m (se 0.33 T2 (fc 20.22 g) = fl 20.51 ure fro 20.51	Jul 0.27 ps 3 to 7 21 from Ta 20.22 pe Table 0.22 pllow ste 20.22 A × T1 20.51 m Table 20.51	Au 0.3 7 in T 2 able 9 20.3 9a) 0.2 eps 3 20.3 + (1 - 20.9 Table	Jg S 3 0. able 90 1 2 2 20 5 0. to 7 in 23 20 — fLA) > 51 20 where a 51 20 e 9b, so	36ep 37 37 37 37 37 37 37 3	0.86 20.89 20.21 0.82 9c) 20.1 A = Liv 20.39 Driate 20.39	0.98 20.55 20.21 0.97 19.63 ring area ÷ 1 19.97 19.97	20 20 20 19 19 19 19 19	25 2 9 9 59 calc	0.37	(86) (87) (88) (89) (90) (91)

Useful gains, hmGm , W = (94)m x (84)m (95)m= 536.04 641.12 720.02 688.13 543.66 361.21 239.11 250.53 392.49 545.93 530.46 504.16		(95)
Monthly average external temperature from Table 8		(55)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		
(97)m= 980.54 955.56 871.24 720.92 547.44 361.43 239.13 250.57 394.4 609.2 806.54 971.11		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		
(98)m= 330.7 211.31 112.51 23.61 2.81 0 0 0 0 47.08 198.78 347.41	4074.04	7,000
Total per year (kWh/year) = Sum(98) _{15,912} =	1274.21](98)] ₍₀₀₎
Space heating requirement in kWh/m²/year	17.36	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the	e latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		7,000-1
Fraction of heat from Community boilers	1	(303a)
Fraction of total space heat from Community boilers (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating Annual space heating requirement	kWh/year 1274.21	7
Space heat from Community boilers (98) x (304a) x (305) x (306) =	1337.92] (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0](308
]`
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement	2059.02	7
If DHW from community scheme:	2058.03	J
	2160.93	(310a)
Water heat from Community boilers (64) x (303a) x (305) x (306) =	2.00.00	_
Water heat from Community boilers $ (64) \times (303a) \times (305) \times (306) = $ Electricity used for heat distribution $ 0.01 \times [(307a)(307e) + (310a)(310e)] = $	34.99	(313)
		(313) (314)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] =	34.99]
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = \begin{bmatrix} \\ \\ \end{bmatrix}$ Cooling System Energy Efficiency Ratio	34.99	(314)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \end{bmatrix}$ Cooling System Energy Efficiency Ratio $\begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \end{bmatrix}$ Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix}$ Electricity for pumps and fans within dwelling (Table 4f):	34.99 0 0	(314)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] = Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	34.99 0 0 191.18	(314) (315) (330a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] = Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans	34.99 0 0 191.18	(314) (315) (330a) (330b)
Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside warm air heating system fans pump for solar water heating	34.99 0 0 191.18 0	(314) (315) (330a) (330b) (330g)

Energy

kWh/year

kg CO2/year

Emission factor Emissions

kg CO2/kWh

El rating (section 14)					87.27	(385)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				15.32	(384)
Total CO2, kg/year	sum of (376)(382) =				1124.7	(383)
CO2 associated with electricity for lighting	ng (332))) x	0.52	= [167.59	(379)
CO2 associated with electricity for pump	s and fans within dwelling	(331)) x	0.52	= [99.23	(378)
Total CO2 associated with space and wa	ater heating (373)	+ (374) + (375) =		[857.88	(376)
CO2 associated with water from immers	ion heater or instantaneous	heater (312) x	0.22	= [0	(375)
CO2 associated with space heating (sec	condary) (309)	x	0	= [0	(374)
Total CO2 associated with community sy	ystems (363).	(366) + (368)(372)		= [857.88	(373)
Electrical energy for heat distribution	[(313)	x	0.52	= [18.16	(372)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	= [839.72	(367)
CO2 from other sources of space and w Efficiency of heat source 1 (%)	ater heating (not CHP) If there is CHP using two	fuels repeat (363) to (366	s) for the second	d fuel	90	(367a)



				User D	etails:						
Assessor Name: Software Name:	Stroma FS	SAP 201	2		Strom Softwa				Versio	on: 1.0.4.26	
			Р	roperty .	Address	C85_B	e Lean				
Address :											
1. Overall dwelling dimens	sions:			Λ	- (m- 2)		Av. Ha	: au la 4 / ua \		\/ala/m3	21
Ground floor					a(m²) 73.4	(1a) x		ight(m) 2.8	(2a) =	Volume(m ³ 205.52	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+	(1d)+(1e)+(1r	n)	73.4	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	205.52	(5)
2. Ventilation rate:											_
Number of chimneys	main heating		econdar eating	у] + [other 0] = [total 0	x 4	40 =	m³ per hou	ir (6a)
Number of open flues	0	_	0	」	0]	0	x	20 =	0	(6b)
Number of intermittent fans						J L			10 =		(7a)
	•					Ļ	3		10 =	30	╡`′
Number of passive vents						Ļ	0			0	(7b)
Number of flueless gas fire	es						0	X 4	40 =	0	(7c)
									Air ch	nanges per ho	our
Infiltration due to chimneys	flues and f	ans - (6	a)+(6b)+(7	'a)+(7b)+(7c) =	Г	30		÷ (5) =	0.15	(8)
If a pressurisation test has bee						continue fr			- (3) =	0.15	(0)
Number of storeys in the	dw <mark>elling</mark> (n	s)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2						•	uction			0	(11)
if both types of wall are pres deducting areas of opening			ponding to	tne great	er wall are	a (atter					
If suspended wooden flo	or, enter 0.2	! (unseal	ed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	r 0.05, else	enter 0								0	(13)
Percentage of windows	and doors di	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	. ,	•	. (45)		0	(15)
Infiltration rate	FO overess	مانه مناه	ia matra	o nor ho	. , , ,	, , ,	12) + (13) -	, ,	oroo	0	(16)
Air permeability value, qualify based on air permeability	•					•	etre or e	invelope	area	5	(17)
Air permeability value applies							is being u	sed		0.4	(18)
Number of sides sheltered					,	·	ŭ			2	(19)
Shelter factor					(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(20)
Infiltration rate incorporating	g shelter fac	ctor			(21) = (18) x (20) =				0.34	(21)
Infiltration rate modified for	monthly wir	nd speed	<u> </u>						1	1	
Jan Feb M	1ar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spec		le 7		-			1	1	1	1	
(22)m= 5.1 5 4.	.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)	m ÷ 4										
	23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	

— — IVI — IVI — IVI	air change tilation: Inp using Apprecovery: efficient of the chanical version of the chanical version or whether (24d) of the chanical version or whether (24d) of the change of the ch	endix N, (2 ciency in % entilation 0 entilation contilation contilation (24c) 0 encle house) m = (22c) 0.57	allowing for with hear of without of positive conditions of the positive of th	or in-use far recover the at recover	equation (Nactor (from Pry (MVI) 0 covery (Nactor (MVI) 0 covery (Nactor (MVI) 0 covery (Nactor (MVI) 0 covery (MVI) 0 covery (Nactor (MVI) 0 covery (MVI) 0 covery (Nactor (MVI) 0 covery (MVII) 0 covery (MVIII) 0 covery (MVIIII) 0 covery (MVIIIII) 0 covery (MVIIIII) 0 covery (MVIIIIIIIII) 0 covery (MVIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	n Table 4h HR) (24a 0 MV) (24b 0 on from c c) = (22b 0 on from I	$\begin{array}{c} (a) = \\ (b) = \\ (a) = \\ (a) = \\ (b) = \\ (b) = \\ (c) = \\$	2b)m + (2 0 2b)m + (2 0	0 23b) 0	0.4 1 - (23c) 0	0 0 0 0 ÷ 100]	
If mechanical verification of the stream of	tilation: np using Apprecovery: efficient of the control of the c	endix N, (2 ciency in % entilation 0 entilation contilation contilation contilation contilation (24c on ole house) m = (22c on ole house) m = (22c on ole house) m = (24c on ole house)	allowing for with hear of without of positive conditions of the positive of th	or in-use far recover on heat	equation (Nactor (from Pry (MVI) 0 covery (Nactor (MVI) 0 covery (Nactor (MVI) 0 covery (Nactor (MVI) 0 covery (MVI) 0 covery (Nactor (MVI) 0 covery (MVI) 0 covery (Nactor (MVI) 0 covery (MVII) 0 covery (MVIII) 0 covery (MVIIII) 0 covery (MVIIIII) 0 covery (MVIIIII) 0 covery (MVIIIIIIIII) 0 covery (MVIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	n Table 4h HR) (24a 0 MV) (24b 0 on from c c) = (22b 0 on from I	$\begin{array}{c} (a) = \\ (b) = \\ (a) = \\ (a) = \\ (b) = \\ (b) = \\ (c) = \\$	2b)m + (2b)m +	0 23b) 0	0	0	()
a) If balanced med talm and all balanced med	chanical version of the chanical version or what then (24d) of the change of the chang	entilation o entilation o entilation o then (24c) o encle hous m = (22c) o.57 enter (24a)	allowing for with hear of without of positive c) = (23b) of the color	or in-use far recover on the properties of the p	overty (MVI) covery (N oventilation ventilation ventilation ventilation ventilation ventilation	n Table 4h HR) (24a 0 MV) (24b 0 on from c c) = (22b 0 on from I	$\begin{array}{c} (a) = \\ (b) = \\ (a) = \\ (a) = \\ (b) = \\ (b) = \\ (c) = \\$	2b)m + (2b)m +	0 23b) 0	0	0	()
a) If balanced medalm= b) If balanced medalm= c) If balanced medalm= db)m= 0 0 c) If whole house if (22b)m < 0 dc)m= 0 d) If natural venti if (22b)m = 1 dd)m= 0.59 0.59 0.59 0.59 0.50 LEMENT Galanced medalm= 0 0 0 0 1 1 1 1 1 1 1 1 1	chanical version of the contract version or what then (24d) of the contract version version of the contract version of the contract version v	entilation o entilation o then (24c o nole hous m = (22c o.57 nter (24a	with head of without of positive of the positi	heat recover of the input volume of the input volume of the input verwise (2)	overy (MVI) covery (N oventilation ventilation ventilation ventilation	HR) (24a 0 MV) (24b 0 on from 0 c) = (22b 0 on from 1	$\begin{array}{c c} (a) & m = (22) \\ \hline (2) & 0 \\ \hline (2) & 0 \\ \hline (3) & 0 \\ \hline (4) & 0 \\ \hline (5) & 0 \\ \hline (6) & 0 \\ \hline (7) & 0 \\ \hline (8) & 0 \\ \hline (9) & 0 \\ \hline (9) & 0 \\ \hline (1) & 0 \\ \hline (1) & 0 \\ \hline (2) & 0 \\ \hline (2) & 0 \\ \hline (2) & 0 \\ \hline (3) & 0 \\ \hline (4) & 0 \\ \hline (4) & 0 \\ \hline (5) & 0 \\ \hline (6) & 0 \\ \hline (7) & 0 \\ \hline (8) & 0 \\ \hline (8) & 0 \\ \hline (9) & 0 \\ \hline (9$	0 2b)m + (2 0 5 × (23b	0 23b) 0	0		()
4a)m= 0 0 b) If balanced me 4b)m= 0 0 c) If whole house if (22b)m < 0 4c)m= 0 0 d) If natural venti if (22b)m = 1 4d)m= 0.59 0.5 Effective air char 5)m= 0.59 0.5 Heat losses and LEMENT 0 al	0 chanical ve 0 extract ver 5 × (23b), 1 0 ation or wh then (24d) 0.58 ge rate - er 0 0.58 heat loss	ontilation of then (24c) on ole house 0.57	without 0 or positive c) = (23b 0 se positive o)m othe	neat reconnection of the input volume of the input volume of the input verwise (2	o covery (N o ventilatio vise (24 o ventilatio	0 MV) (24b 0 on from c c) = (22b 0	0 0)m = (22 0 0 0 0 0 m + 0.	0 2b)m + (2 0 5 × (23b	0 23b) 0	0	÷ 100]	(1
b) If balanced me 4b)m= 0 0 c) If whole house if (22b)m < 0 4c)m= 0 0 d) If natural venti if (22b)m = 1 4d)m= 0.59 0.5 Effective air char 5)m= 0.59 0.5 LEMENT 0 all	chanical version of the contract version or what the contract version of the contract version version of the contract version version of the contract version v	entilation of then (24c) 0 nole house) m = (22c) 0.57	without 0 or positiv c) = (23b 0 se positiv o)m othe 0.57	heat rec ove input vo); othervo ove input verwise (2	covery (N 0 ventilation vise (24 0 ventilation	MV) (24b 0 on from (c) = (22b 0 on from I	$\begin{array}{c c} (m) & \text{o} \\ (m) & o$	2b)m + (2 0 5 × (23b	23b) 0	0]	(1
c) If whole house if (22b)m < 0 d) If natural venti if (22b)m = 1 d) m= 0.59 0.5 Effective air char 0.59 0.5 Heat losses and all	0 extract ver 5 × (23b), 1 0 ation or wh then (24d) 0 0.58 ge rate - er 0 0.58 heat loss	0 ntilation of then (24c) 0 nole house)m = (22c) 0.57 nter (24a)	opr positive c) = (23b operation of the content of	o ye input v o); otherv o ye input v erwise (2	oventilation	0 on from c c) = (22k 0 on from l	0 outside o) m + 0.	0 5 × (23b	0] 1	
c) If whole house if (22b)m < 0 ic)m= 0 0 d) If natural venti if (22b)m = 1 id)m= 0.59 0.5 Effective air char 5)m= 0.59 0.5 Heat losses and all	extract ver 5 × (23b), 1 0 ation or whom (24d) 0.58 ge rate - er 0 0.58 heat loss	ntilation of then (24c) 0 nole hous 0 = (22c) 0.57 nter (24a	or positive of pos	re input vo); othervoor	ventilation vise (24	on from (c) = (22t) 0 on from I	outside b) m + 0.	5 × (23b)]	
if (22b)m < 0 d) If natural venti if (22b)m = 1 d)m= 0.59 0.5 Effective air char 0.59 0.5 Heat losses and all	5 x (23b), to 0 ation or whom (24d) 0.58 ge rate - er 0.58 heat loss	then (24c 0 nole hous 0 = (22t 0.57	0 se positivo)m othe	o); otherv o ve input verwise (2	vise (24 0 ventilation	c) = (22b 0 on from l	o) m + 0.	<u> </u>		0	1	
d) If natural venti if (22b)m = 1 Ad)m= 0.59 0.5 Effective air char 0.59 0.5 B. Heat losses and all the control of the cont	ation or whethen (24d) 0.58 ge rate - er 0.58 heat loss	nole hous m = (22b 0.57 nter (24a	se positiv o)m othe	ve input verwise (2	ventilatio	on from I		0	0	0	1	
if (22b)m = 1 d)m= 0.59 0.5 Effective air char)m= 0.59 0.5 Heat losses and EMENT 0 al	then (24d) 0.58 ge rate - er 0.58 heat loss)m = (22b 0.57 nter (24a	o)m othe	rwise (2			oft		_	ı ĭ	1	(
Effective air char 5)m= 0.59 0.5 Heat losses and all	ge rate - er 0.58 heat loss	nter (24a		0.55		- L\ -		0.5]		•		
. Heat losses and LEMENT G	0.58	- `) or (2/h		0.55	0.55	0.56	0.57	0.57	0.58		(
. Heat losses and EMENT G	heat loss	0.57	, UI (24L	o) or (240	c) or (24	d) in box	x (25)				•	
L EMENT a			0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(
L EMENT a		naramete	or.					•				
	ea (m²)	Openin m	gs	Net Ard A ,n		U-valı W/m2		A X U (W/ł	<)	k-value		A X k kJ/K
				2.5	x	1.2	= [3				(
o <mark>rs Ty</mark> pe 2				2.5	X	1.2	= -	3	Ħ			(
indows Type 1				1.18	x1.	/[1/(1.4)+	0.04] =	1.56	Ħ			(
indows Type 2				2.55		/[1/(1.4)+		3.38	片			(
ndows Type 3				1.61	_	/[1/(1.4)+	l.	2.13				(
indows Type 4				3.17	=	/[1/(1.4)+		4.2				(
indows Type 5				1.61		/[1/(1.4)+		2.13				(
	22.46	18.34	4		_		— ¦		=			(
utal area of eleme	33.16	10.34	*	64.82	=	0.18	= [11.67				
or windows and roof v	·	effective wi	ndow H-va	83.16		n formula 1	/[(1/ ₋ valı	ر مدارما (مارما	s aiven in	naragrani	132	(
nclude the areas on l					atou using	y TOTTILIA T	/[(1/ O - Vaic	ic)+0.0+j a	3 giveii iii	paragrapi	7 3.2	
bric heat loss, W	'K = S (A x)	U)				(26)(30)) + (32) =				35.3	5 (
eat capacity Cm =	S(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(
ermal mass para	meter (TMI	P = Cm ÷	TFA) in	kJ/m²K			Indica	tive Value:	Medium		250) (
design assessments be used instead of a			constructi	ion are not	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
ermal bridges : S	, ,		• .	•	<						4.16	6 (
etails of thermal bride tal fabric heat los	_	nown (36) =	= 0.05 x (3	1)			(33) +	(36) =			39.5	1 (
ntilation heat los	calculated	d monthly	У				(38)m	= 0.33 × (25)m x (5))		_
Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
m= 40.16 39.9	1 39.68	38.56	38.35	37.38	37.38	37.2	37.75	38.35	38.77	39.21		(
eat transfer coeffi	cient, W/K						(39)m	= (37) + (3	38)m			
)m= 79.67 79.4	3 79.19	78.07	77.86	76.89	76.89	76.71	77.27	77.86	78.29	78.73]	

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.09	1.08	1.08	1.06	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.07		
(10)									<u> </u>	Sum(40) ₁ .		1.06	(40)
Number of day	s in mo	nth (Tabl	le 1a)					•	tvolago =	Curri (10)	12 / 12—	1.00	()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
` ′						<u> </u>	l		<u> </u>				
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13		33		(42)
Annual average Reduce the annual not more that 125	l average	hot water	usage by	5% if the a	welling is	designed t			se target o		.44		(43)
Jan	Feb	Mar		May	Jun	Jul	Διια	Sep	Oct	Nov	Dec		
Hot water usage ir			Apr				Aug (43)	Sep	Oct	INOV	Dec		
			87.65			1	· <i>′</i>	87.65	04.00	T 04.8	00.20		
(44)m= 98.38	94.8	91.23	67.05	84.07	80.49	80.49	84.07		91.23	94.8	98.38	4070.04	7(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.r	n x nm x D	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1073.24	(44)
(45)m= 145.9	127.6	131.67	114.8	110.15	95.05	88.08	101.07	102.28	119.2	130.11	141.29		
(43)111= 143.3	127.0	131.07	114.0	110.13	95.05	00.00	101.07				l .	1407.10	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar = Su	m(45) ₁₁₂ =		1407.19	(43)
(46)m= 21.88	19.14	19.75	17.22	16.52	14.26	13.21	15.16	15.34	17.88	19.52	21.19		(46)
Water storage		19.73	17.22	10.52	14.20	13.21	13.10	13.34	17.00	19.52	21.19		(10)
Storage volum		includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						` '
Otherwise if no	_			_				ers) ente	er '0' in ((47)			
Water storage	loss:		·					·					
a) If manufacti	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m watei	rstorage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufact		_	-		or is not	known:							` '
Hot water stora	•			e 2 (kW	h/litre/da	ıy)					0		(51)
If community h	_		on 4.3										
Volume factor			O.b.								0		(52)
Temperature fa											0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	•								0.	75		(55)
Water storage	loss cal	culated f	or each	month		_	((56)m = (55) × (41)ı	m 				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by						ı —	<u> </u>		ı —	- 	<u> </u>		
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combiles	ام مامان مام	fa., a a a b		(04)	(00) . 20	CE (44)	١						
Combi loss (61)m= 0	calculated 0	or each		0	(60) ÷ 30	05 × (41))m 0	0	0	0	0	1	(61)
				<u> </u>			<u> </u>	Ļ	<u> </u>	ļ.		(E0)m + (61)m	(01)
(62)m= 192.4	-i	178.27	159.89	156.74	140.14	134.67	147.67	147.37	165.79	175.2	187.89	· (59)m + (61)m]	(62)
Solar DHW inp			<u> </u>	<u> </u>		<u> </u>		1				J	(02)
(add addition									ii contribu	lion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0]	(63)
Output from	water hea	ter					Į					ı	
(64)m= 192.4		178.27	159.89	156.74	140.14	134.67	147.67	147.37	165.79	175.2	187.89]	
						•	Out	put from w	ater heate	r (annual)	12	1955.81	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 85.7	1	81.06	74.24	73.9	67.68	66.56	70.88	70.08	76.91	79.34	84.26	1	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):	-								
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 116.2	9 116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29		(66)
Ligh <mark>ting g</mark> air	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 18.3	2 16.27	13.23	10.02	7.49	6.32	6.83	8.88	11.92	15.13	17.66	18.83		(67)
App <mark>liance</mark> s (gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m= 205.	1 207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05		(68)
Cooking gai	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5		-		
(69)m= 34.6	3 34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63		(69)
Pumps and	fans gains	(Table 5	5a)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m= -93.0	3 -93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03		(71)
Water heating	ng gains (1	Table 5)										_	
(72)m= 115.	3 113.24	108.95	103.12	99.33	94	89.46	95.27	97.33	103.37	110.19	113.25		(72)
Total intern	al gains =	:			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 399.6	397.62	384.93	364.46	343.74	323.69	310.62	316.35	326.81	347.48	371.24	389.01		(73)
6. Solar ga	ins:												
Solar gains ar		•				•	itions to c	onvert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a	-	g_ Fable 6b	т	FF able 6c		Gains (W)	
- .							. –		_ '				7
East 0.9		X	1.6			19.64	X	0.63	x	0.7	=	19.33	(76)
East 0.9		X	1.6		_	19.64	x	0.63	x	0.7	=	19.33	(76)
East 0.9			1.6			38.42	x	0.63	x	0.7	=	37.81	<u>(76)</u>
East 0.9		X	1.6		-	38.42	x	0.63	x	0.7	=	37.81	(76)
East 0.9	× 0.77	X	1.6	61	x 6	33.27	X	0.63	X	0.7	=	62.27	(76)

	_												_
East	0.9x	0.77	X	1.61	X	63.27	Х	0.63	X	0.7	=	62.27	(76)
East	0.9x	0.77	X	1.61	x	92.28	X	0.63	X	0.7	=	90.81	(76)
East	0.9x	0.77	X	1.61	X	92.28	X	0.63	X	0.7	=	90.81	(76)
East	0.9x	0.77	X	1.61	x	113.09	x	0.63	X	0.7	=	111.29	(76)
East	0.9x	0.77	X	1.61	x	113.09	X	0.63	X	0.7	=	111.29	(76)
East	0.9x	0.77	X	1.61	X	115.77	X	0.63	X	0.7	=	113.93	(76)
East	0.9x	0.77	X	1.61	x	115.77	X	0.63	X	0.7	=	113.93	(76)
East	0.9x	0.77	X	1.61	x	110.22	x	0.63	X	0.7	=	108.46	(76)
East	0.9x	0.77	X	1.61	X	110.22	X	0.63	X	0.7	=	108.46	(76)
East	0.9x	0.77	X	1.61	x	94.68	x	0.63	X	0.7	=	93.17	(76)
East	0.9x	0.77	X	1.61	x	94.68	x	0.63	X	0.7	=	93.17	(76)
East	0.9x	0.77	X	1.61	x	73.59	x	0.63	X	0.7	=	72.42	(76)
East	0.9x	0.77	x	1.61	x	73.59	x	0.63	x	0.7	=	72.42	(76)
East	0.9x	0.77	x	1.61	x	45.59	x	0.63	x	0.7	=	44.86	(76)
East	0.9x	0.77	X	1.61	x	45.59	x	0.63	X	0.7	=	44.86	(76)
East	0.9x	0.77	X	1.61	x	24.49	x	0.63	X	0.7	=	24.1	(76)
East	0.9x	0.77	x	1.61	x	24.49	x	0.63	X	0.7	=	24.1	(76)
East	0.9x	0.77	X	1.61	X	16.15	X	0.63	X	0.7	=	15.89	(76)
East	0.9x	0.77	x	1.61	x	16.15	х	0.63	x	0.7	=	15.89	(76)
South	0.9x	0.77	x	1.18	х	46.75	×	0.63	x	0.7	=	16.86	(78)
South	0.9x	0.77	x	1.18	x	76.57	x	0.63	x	0.7	=	27.61	(78)
South	0.9x	0.77	x	1.18	x	97.53	Х	0.63	x	0.7	=	35.17	(78)
South	0.9x	0.77	x	1.18	x	110.23	X	0.63	x	0.7	=	39.75	(78)
South	0.9x	0.77	x	1.18	х	114.87	x	0.63	x	0.7	=	41.43	(78)
South	0.9x	0.77	X	1.18	x	110.55	x	0.63	X	0.7	=	39.87	(78)
South	0.9x	0.77	X	1.18	x	108.01	x	0.63	X	0.7	=	38.95	(78)
South	0.9x	0.77	X	1.18	x	104.89	x	0.63	X	0.7	=	37.83	(78)
South	0.9x	0.77	X	1.18	x	101.89	x	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	x	1.18	x	82.59	x	0.63	x	0.7	=	29.78	(78)
South	0.9x	0.77	x	1.18	x	55.42	x	0.63	x	0.7	=	19.98	(78)
South	0.9x	0.77	X	1.18	x	40.4	x	0.63	X	0.7	=	14.57	(78)
West	0.9x	0.77	x	2.55	x	19.64	X	0.63	X	0.7	=	15.31	(80)
West	0.9x	0.77	x	3.17	x	19.64	x	0.63	X	0.7	=	19.03	(80)
West	0.9x	0.77	x	2.55	x	38.42	X	0.63	X	0.7	=	29.94	(80)
West	0.9x	0.77	x	3.17	x	38.42	X	0.63	X	0.7	=	37.22	(80)
West	0.9x	0.77	x	2.55	x	63.27	x	0.63	x	0.7	=	49.31	(80)
West	0.9x	0.77	x	3.17	x	63.27	х	0.63	x	0.7	=	61.3	(80)
West	0.9x	0.77	x	2.55	x	92.28	x	0.63	x	0.7	j =	71.92	(80)
West	0.9x	0.77	x	3.17	x	92.28	x	0.63	x	0.7	j =	89.4	(80)
West	0.9x	0.77	x	2.55	x	113.09	x	0.63	x	0.7] =	88.13	(80)
West	0.9x	0.77	x	3.17	x	113.09	x	0.63	x	0.7] =	109.56	(80)
	_		•		•		•				-		-

West	0.9x	0.77	X	2.5	55	X	11	15.77	X	0.63	3	x	0.7			90.22	(80)
West	0.9x	0.77	X	3.1	7	x	11	15.77	X	0.63	3	x	0.7	=		112.16	(80)
West	0.9x	0.77	X	2.5	55	X	11	10.22	X	0.63	3	x	0.7	=		85.89	(80)
West	0.9x	0.77	X	3.1	7	X	11	10.22	X	0.63	3	x	0.7	=		106.78	(80)
West	0.9x	0.77	X	2.5	55	X	9	4.68	X	0.63	3	x	0.7			73.78	(80)
West	0.9x	0.77	X	3.1	7	X	9	4.68	X	0.63	3	x	0.7			91.72	(80)
West	0.9x	0.77	X	2.5	55	X	7	3.59	X	0.63	3	x	0.7	=		57.35	(80)
West	0.9x	0.77	X	3.1	7	X	7	'3.59	X	0.63	3	x	0.7			71.29	(80)
West	0.9x	0.77	X	2.5	55	X	4	5.59	X	0.63	3	x	0.7	=		35.53	(80)
West	0.9x	0.77	X	3.1	7	X	4	5.59	X	0.63	3	x	0.7	=		44.17	(80)
West	0.9x	0.77	X	2.5	55	X	2	4.49	X	0.63	3	x	0.7	=		19.08	(80)
West	0.9x	0.77	X	3.1	7	X	2	4.49	X	0.63	3	x	0.7	=		23.72	(80)
West	0.9x	0.77	X	2.5	55	X	1	6.15	X	0.63	3	x	0.7	=		12.59	(80)
West	0.9x	0.77	X	3.1	7	X	1	6.15	X	0.63	3	x	0.7			15.65	(80)
Solar ga		watts, cal			n month	1			` 	= Sum(74	4)m(82)m	_		_		
(83)m=	89.85		270.31	382.69	461.71		70.1	448.55	389.	67 310	.22	199.2	110.99	74.59			(83)
Ĭг		nternal an				-									7		(0.4)
(84)m=	489.45	568.01	655.24	747.15	805.44	79	93.79	759.17	706.	01 637	.03 5	546.68	482.23	463.6			(84)
7. Mea	ın inter	nal tempe	erature (heating	seasor	า)											
Tempe	erature	during he	ating pe	eriods ir	the livi	ing	area f	from Tab	ole 9,	Th1 (°C	C)					21	(85)
Utilisat	ion fac	tor for goi															
	ion rac	ioi ioi gai	ins for li	ving are	ea, h1,m	n (s	ee Ta	ble 9a)									
	Jan	Feb	Mar	ving are Apr	ea, h1,m May		ee Ta Jun	ble 9a) Jul	Au	ıg S	ер	Oct	Nov	Dec	 []		
(86)m=						Ĺ			Au 0.4	_		Oct 0.96	Nov 0.99	Dec	;		(86)
(86)m=	Jan 1	Feb	Mar 0.98	Apr 0.92	May 0.79		Jun 0.6	Jul 0.44	0.4	9 0.7	76	_	_		;		(86)
(86)m=	Jan 1	Feb 0.99	Mar 0.98	Apr 0.92	May 0.79	ollo	Jun 0.6	Jul 0.44	0.4	9 0.7 able 9c)	76	_	_				(86)
(86)m= Mean i (87)m=	Jan 1 interna 19.91	Feb 0.99 I tempera	0.98 ture in li 20.34	Apr 0.92 iving are 20.67	0.79 ea T1 (f	follo 2	Jun 0.6 ow ste 20.98	Jul 0.44 ps 3 to 7 21	0.4 7 in T 20.9	9 0.7 able 9c)	94	0.96	0.99	1			` ′
(86)m= Mean i (87)m=	Jan 1 interna 19.91	0.99 I tempera 20.07	0.98 ture in li 20.34	Apr 0.92 iving are 20.67	0.79 ea T1 (f	follo 2	Jun 0.6 ow ste 20.98	Jul 0.44 ps 3 to 7 21	0.4 7 in T 20.9	9 0.7 able 9c) 99 20. 7, Th2 (°	76) 94 :	0.96	0.99	1			` ′
(86)m= Mean i (87)m= Tempe (88)m=	Jan 1 interna 19.91 erature 20.01	Feb 0.99 I tempera 20.07 during he 20.02	Mar 0.98 ture in li 20.34 eating pe	Apr 0.92 iving are 20.67 eriods in 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03	follo 2 f dw	Jun 0.6 www.ste 20.98 velling 20.04	Jul 0.44 ps 3 to 7 21 from Ta 20.04	0.47 in T 20.9 able 9 20.0	9 0.7 able 9c) 99 20. 7, Th2 (°	76) 94 :	0.96 20.63	0.99	19.88			(87)
(86)m= Mean i (87)m= Tempe (88)m=	Jan 1 interna 19.91 erature 20.01	Feb 0.99 I tempera 20.07 during he	Mar 0.98 ture in li 20.34 eating pe	Apr 0.92 iving are 20.67 eriods in 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03	follo 2 dw 2 h2,	Jun 0.6 www.ste 20.98 velling 20.04	Jul 0.44 ps 3 to 7 21 from Ta 20.04	0.47 in T 20.9 able 9 20.0	9 0.7 able 9c) 99 20.), Th2 (°	94 : C)	0.96 20.63	0.99	19.88			(87)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m=	Jan 1 Interna 19.91 Prature 20.01 Ion fac	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do	May 0.79 ea T1 (f 20.89 o rest of 20.03 welling, 0.74	follo 2 dw 2 h2,	Jun 0.6 w ste 20.98 velling 20.04 m (se 0.52	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35	0.4 7 in T 20.9 able 9 20.0 9a) 0.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20.	94 : C) 04 :	0.96 20.63 20.03	20.21	19.88			(87)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i	Jan 1 Interna 19.91 Prature 20.01 Ition factor 1 Interna	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99 I tempera	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest	May 0.79 ea T1 (fr 20.89 n rest of 20.03 welling, 0.74 of dwell	dw 2 h2,	Jun 0.6 www.ste 20.98 velling 20.04 mm (sec 0.52	Jul 0.44 ps 3 to 7 21 from Ta 20.04 pe Table 0.35 pollow ste	0.4 7 in T 20.9 able 9 20.0 9a) 0.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6	76) 94 : C) 04 : 58 Γable	0.96 20.63 20.03 0.94 9c)	0.99 20.21 20.03	1 19.88 20.02			(87) (88) (89)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m=	Jan 1 Interna 19.91 Prature 20.01 Ion fac	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do	May 0.79 ea T1 (f 20.89 o rest of 20.03 welling, 0.74	dw 2 h2,	Jun 0.6 w ste 20.98 velling 20.04 m (se 0.52	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35	0.4 7 in T 20.9 able 9 20.0 9a) 0.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6	994 :: CC) :: 004 :: Table ::	0.96 20.63 20.03 0.94 9c) 19.61	0.99 20.21 20.03 0.99	1 19.88 20.02 1 18.53		0.37	(87) (88) (89) (90)
(86)m=	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65	May 0.79 ea T1 (for 20.89 or rest of 20.03 welling, 0.74 of dwell 19.93	follo 2 follo 2 h2, (ling 2	Jun 0.6 w ste 20.98 velling 20.04 m (se 0.52 T2 (fo	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow stee 20.04	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19.	94 : C) 04 : Fable 99 fLA	0.96 20.63 20.03 0.94 9c) 19.61	0.99 20.21 20.03	1 19.88 20.02 1 18.53		0.37	(87) (88) (89)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m=	Jan 1 Interna 19.91 erature 20.01 ion fac 1 interna 18.56	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99 I tempera 18.8	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65	May 0.79 ea T1 (fr 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93	f dw 2 h2, (Illing 2	Jun 0.6 www.ste 20.98 velling 20.04 m (se 0.52 T2 (fo 20.03	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 10 7 in 7 04 19.	94 : C) 04 : Table 99 fLA	0.96 20.63 20.03 0.94 9c) 19.61	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4	1 19.88 20.02 1 18.53		0.37	(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m=	Jan 1 interna 19.91 erature 20.01 interna 18.56 interna 19.06	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97 ture in t 19.19 ture (for	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65	May 0.79 ea T1 (for 20.89 or rest of 20.03 welling, 0.74 of dwell 19.93 ole dwell 20.28	h2, (ling 2	Jun 0.6 ow ste 20.98 relling 20.04 m (se 0.52 T2 (fo 20.03	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow ste 20.04 LA × T1 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 10 7 in 104 19. - fLA) × 39 20.	76) 94 : C) 04 : 68 Γable 99 : fLA T2 34	0.96 20.63 20.03 0.94 9c) 19.61 19.98	0.99 20.21 20.03 0.99	1 19.88 20.02 1 18.53		0.37	(87) (88) (89) (90)
Mean i (86)m= Mean i (87)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56 Interna 19.06 adjustn	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99 I tempera 18.8 I tempera 19.27 nent to the	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19 ture (for	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal	May 0.79 ea T1 (fr 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwe 20.28 temper	follo 2 f dw 2 h2, (ling 2	Jun 0.6 www.ste 20.98 velling 20.04 m (se 0.52 T2 (fo 20.03 g) = fl 20.38 ure fro	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1 20.39 m Table	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3 e 4e, 1	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 10 7 in 7 04 19.	94 : C) 04 : S8 Γable 99 fLA T2 34 pprop	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4	1 19.88 20.02 1 18.53 4) =		0.37	(87) (88) (89) (90) (91) (92)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m=	Jan 1 1 19.91 erature 20.01 cion factor 1 18.56 enterna 19.06 adjustn 19.06	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97 ture in tr 19.19 ture (for 19.61 e mean 19.61	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65	May 0.79 ea T1 (for 20.89 or rest of 20.03 welling, 0.74 of dwell 19.93 ole dwell 20.28	follo 2 f dw 2 h2, (ling 2	Jun 0.6 ow ste 20.98 relling 20.04 m (se 0.52 T2 (fo 20.03	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow ste 20.04 LA × T1 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 10 7 in 7 04 19.	94 : C) 04 : S8 Γable 99 fLA T2 34 pprop	0.96 20.63 20.03 0.94 9c) 19.61 19.98	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4	1 19.88 20.02 1 18.53		0.37	(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Span	Jan 1 Interna 19.91 erature 20.01 ion fac 1 interna 18.56 interna 19.06 adjustn 19.06 ce hea	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the 19.27 ting requi	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19 ture (for 19.61 e mean 19.61 rement	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03	May 0.79 ea T1 (fr 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwe 20.28 temper 20.28	follo 2 f dw 2 h2, (ling 2 felling 2	Jun 0.6 www.ste 20.98 velling 20.04 mr (se 20.03 g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1 20.39 m Table 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0 2 4e, v 20.0	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19.	76 94 :: C) 04 :: Table 99 1LA 12 13 14 15 15 15 15 15 15 15	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4) 19.45	1 19.88 20.02 1 18.53 4) =			(87) (88) (89) (90) (91) (92)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Spar	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56 Interna 19.06 adjustn 19.06 ce head to the i	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97 ture in tr 19.19 ture (for 19.61 e mean 19.61 rement rement	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwell 20.28 temper 20.28	follo 2 f dw 2 h2, (ling 2 felling 2	Jun 0.6 www.ste 20.98 velling 20.04 mr (se 20.03 g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1 20.39 m Table 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0 2 4e, v 20.0	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19.	76 94 :: C) 04 :: Table 99 1LA 12 13 14 15 15 15 15 15 15 15	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4) 19.45	1 19.88 20.02 1 18.53 4) =			(87) (88) (89) (90) (91) (92)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Spar	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56 Interna 19.06 adjustn 19.06 ce head to the i	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the 19.27 ting requi mean inte	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97 ture in tr 19.19 ture (for 19.61 e mean 19.61 rement rement	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwell 20.28 temper 20.28	follo 2 follo 2 h2, h2, c follo 2 follo 3 follo 4 fo	Jun 0.6 www.ste 20.98 velling 20.04 mr (se 20.03 g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1 20.39 m Table 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0 2 4e, v 20.0	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19	76 94 :: C) 04 :: Table 99 1LA 12 13 14 15 15 15 15 15 15 15	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4) 19.45	1 19.88 20.02 1 18.53 4) =			(87) (88) (89) (90) (91) (92)
Mean i (86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Apply a (93)m= 8. Span Set Tinthe util	Jan 1 Interna 19.91 erature 20.01 Iion fac 1 Interna 18.56 Interna 19.06 adjustn 19.06 ce head to the isisation Jan	Teb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the 19.27 ting requi mean inte factor for	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19 ture (for 19.61 e mean 19.61 rement rnal tem gains u Mar	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03 enperaturising Ta	May 0.79 ea T1 (for 20.89 no rest of 20.03 welling, 0.74 of dwell 19.93 ole dwell 20.28 temper 20.28 re obtainable 9a	follo 2 follo 2 h2, h2, c follo 2 follo 3 follo 4 fo	Jun 0.6 www.ste 20.98 velling 20.04 mm (se 0.52 T2 (fo 20.03) g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow ste 20.04 LA × T1 20.39 m Table 20.39 ep 11 of	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0 20.0 Table	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19	76 94 2 2 2 2 2 2 2 2 2	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98 Γi,m=	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4 19.45 19.45	1 19.88 20.02 1 18.53 1) = 19.03			(87) (88) (89) (90) (91) (92)
Mean i (86)m= Mean i (87)m= Utilisat (89)m= Mean i (90)m= Apply a (93)m= 8. Spa Set Ti the util	Jan 1 Interna 19.91 erature 20.01 Iion fac 1 Interna 18.56 Interna 19.06 adjustn 19.06 ce head to the isisation Jan	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the 19.27 ting requi mean inte factor for	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19 ture (for 19.61 e mean 19.61 rement rnal tem gains u Mar	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03 enperaturising Ta	May 0.79 ea T1 (for 20.89 no rest of 20.03 welling, 0.74 of dwell 19.93 ole dwell 20.28 temper 20.28 re obtainable 9a	h2, h2, colloing ling 2 ratu 2	Jun 0.6 www.ste 20.98 velling 20.04 mm (se 0.52 T2 (fo 20.03) g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow ste 20.04 LA × T1 20.39 m Table 20.39 ep 11 of	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0 20.0 Table	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19 fLA) × 39 20. where a 39 20. e 9b, so	76 94 2 2 2 2 2 2 2 2 2	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98 Γi,m=	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4 19.45 19.45	1 19.88 20.02 1 18.53 1) = 19.03			(87) (88) (89) (90) (91) (92)

Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 486.61 560.75 632.86 671.45 608.24 435.85 290.7 304.48 450.78 512.21 476.27 461.53	(95)	i
Monthly average external temperature from Table 8	(00)	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96))
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	ı	
(97)m= 1175.76 1141.44 1038.55 868.76 668.44 444.5 291.71 306.35 482.09 730.72 966.92 1167.55	(97))
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		
(98)m= 512.73 390.23 301.83 142.06 44.79 0 0 0 162.57 353.27 525.28		
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ =	2432.76 (98)	1
Space heating requirement in kWh/m²/year	33.14 (99)	ı
9a. Energy requirements – Individual heating systems including micro-CHP)		
Space heating:		
Fraction of space heat from secondary/supplementary system	0 (201	1)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1 (202	2)
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =	1 (204	4)
Efficiency of main space heating system 1	93.5 (206	3)
Efficiency of secondary/supplementary heating system, %	0 (208	3)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	kWh/year	
Space heating requirement (calculated above)		
512.73 390.23 301.83 142.06 44.79 0 0 0 0 162.57 353.27 525.28		
$(211)m = \{[(98)m \times (204)]\} \times 100 \div (206)$	(211	1)
548.37 417.35 322.82 151.94 47.9 0 0 0 173.87 377.83 561.8		
Total (kWh/year) =Sum(211) _{15,1012} =	2601.88 (211	1)
Space heating fuel (secondary), kWh/month		
$= \{[(98)m \times (201)] \} \times 100 \div (208)$		
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0		
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215	5)
Water heating		
Output from water heater (calculated above)	I	
192.49 169.69 178.27 159.89 156.74 140.14 134.67 147.67 147.37 165.79 175.2 187.89		
Efficiency of water heater	79.8 (216	
(217)m= 87.3 86.97 86.21 84.5 81.95 79.8 79.8 79.8 79.8 84.76 86.65 87.41	(217	7)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m		
(219)m= 220.48 195.12 206.79 189.21 191.26 175.62 168.76 185.04 184.67 195.6 202.2 214.94		
Total = Sum(219a) ₁₁₂ =	2329.7 (219	3)
Annual totals kWh/year	kWh/year	
Space heating fuel used, main system 1	2601.88	
Water heating fuel used	2329.7	
Electricity for pumps, fans and electric keep-hot		
central heating pump:	(230	Jc)

boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	75 (231)
Electricity for lighting			323.47 (232)
12a. CO2 emissions - Individual heating sys	tems including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	562.01 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	503.22 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1065.22 (265)

(231) x

(232) x

TER = 17.33 (273)

Electricity for pumps, fans and electric keep-hot

Electricity for lighting

Total CO2, kg/year

(267)

(268)

(272)

38.93

167.88

1272.03

0.519

0.519

sum of (265)...(271) =

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Vorsio	on: 1.0.4.26	
Software Name:		roperty	Address:				versio)II. 1.U. 4 .20	
Address :	The Charlie Ratchford Cent					V1 8HF			
1. Overall dwelling dime		,			,				
		Area	a(m²)		Av. He	ight(m)		Volume(m	')
Ground floor			50	(1a) x	2	2.8	(2a) =	140	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1r	n)	50	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	140	(5)
2. Ventilation rate:									
	main secondar heating heating	ry	other		total			m³ per hou	ir
Number of chimneys	0 + 0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	T + F	0	= [0	x 2	20 =	0	(6b)
Number of intermittent far	ns			Ī	0	x	10 =	0	(7a)
Number of passive vents				Ē	0	x -	10 =	0	(7b)
Number of flueless gas fin	res			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(7a)$				0		÷ (5) =	0	(8)
	een ca <mark>rried out or is intended, procee</mark>	d to (17), (otherwise c	ontinue fr	om (9) to ((16)			7(0)
Number of storeys in the Additional infiltration	ie dweiling (ris)					[(9)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame or	0.35 fo	r masonr	v constr	uction	[(0)	TAOLT -	0	(11)
	resent, use the value corresponding to			•					`'
deducting areas of opening	ngs); if equal user 0.35 loor, enter 0.2 (unsealed) or 0	1 (coole	ad) also	ontor O					7(10)
If no draught lobby, ent	,	. i (Seale	eu), eise i	enter 0				0	(12)
• • • • • • • • • • • • • • • • • • • •	s and doors draught stripped							0	(14)
Window infiltration	9		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
•	q50, expressed in cubic metre	•	•	•	etre of e	nvelope	area	3	(17)
·	ity value, then $(18) = [(17) \div 20] + (18)$							0.15	(18)
Air permeability value applies Number of sides sheltere	s if a pressurisation test has been dor	ne or a deg	gree air per	meability	is being u	sed			7(10)
Shelter factor	u		(20) = 1 - [0.0 75 x (1	19)] =			0.85	(19)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified for	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Faster (22a) (22	2)m : 4								
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18]	
(==0)		1 0.00	0.02	•	L	L2	Lo	I	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		•	rate for t	he appli	cable ca	se	!	•					
If mechanica			l' N. (0	01) (00	\ - (15// (1	. (00)	\ (00 \			0.5	(23a
If exhaust air h) = (23a)			0.5	(23b
If balanced with		-	-	_								76.5	(230
a) If balance						<u> </u>	- ` ` - 	ŕ	r ´ `		``) ÷ 100] 1	(0.4-
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	J	(24a
b) If balance							r Ó Ì	i `	r Ó - Ò	 		1	(2.4h
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h if (22b)n				-	-				5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)n				•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change	rate - er	nter (24a	or (24b	o) or (24d	c) or (24	d) in box	x (25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and he	eat loss	paramete	er:							_	_	_
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Doo <mark>rs Type 1</mark>					2.5	×	1.3	=	3.25				(26)
Doo <mark>rs Ty</mark> pe 2					2.5	x	1	∃ \- i	2.5	Ħ			(26)
Windows Type	1				1.3	x1/	/[1/(1.3)+	0.04] =	1.61	Ħ			(27)
Windows Type	2				2.6	x ₁ ,	/[1/(1.3)+	0.04] =	3.21	「			(27)
Windows Type	3				1.9	x1,	/[1/(1.3)+	0.04] =	2.35	Ħ			(27)
Windows Type	4				4.1	x ₁ ,	/[1/(1.3)+	0.04] =	5.07	Ħ			(27)
Windows Type	5				2.6		/[1/(1.3)+	0.04] =	3.21	Ħ			(27)
Walls	67.7	6	17.5	\neg	50.26	=	0.15		7.54	╡ ┌		\neg	(29)
Total area of e	L		17.0		67.76	=	0.10		7.01				(31)
* for windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	(0.)
** include the area						-				-			
Fabric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				28.74	(33)
Heat capacity	`	•						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge						<						3.38	(36)
<i>if details of therma</i> Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			32.12	(37)
Ventilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5)	1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 12.94	12.79	12.64	11.91	11.76	11.02	11.02	10.88	11.32	11.76	12.06	12.35	1	(38)
Heat transfer o	coefficier	nt, W/K	•				•	(39)m	= (37) + (37)	38)m	•	•	
(39)m= 45.06	44.91	44.77	44.03	43.88	43.15	43.15	43	43.44	43.88	44.18	44.47]	
			(0.0.00)	1	ww.stroma				L Average =	Sum(30).	/12-	13.00	age 2 of 389)

eat lo	ss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
0)m=	0.9	0.9	0.9	0.88	0.88	0.86	0.86	0.86	0.87	0.88	0.88	0.89		
umbo	r of dov	a in man	sth /Tabl	lo 1o\						Average =	Sum(40) ₁ .	12 /12=	0.88	(4
	Jan	s in mor Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
.1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
·/··· [<u> </u>		0.		.					.				`
4. Wa	ter heat	ing ener	gy requi	rement:								kWh/ye	ar:	
ssum	ed occu	pancy, N	N								1	69		(4
if TF		0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		.00		•
								(25 x N)				.34		(4
		_				nweiling is not and co	_	to achieve	a water us	se target o	Ι			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate	er usage ir	litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-					
4)m=	81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77		
neray a	content of	hot water	used - cal	culated mo	onthly = 4	190 x Vd.r	n x nm x F.	Tm / 3600		Total = Su			892.08	
5)m=	121.27	106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44		
		.00.00	.001.10	001.12	01.00	, , , , ,	. 9.2	0,101		Total = Su		L .	1169.66	
instant	aneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	to (61)					
6)m=	18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62		(
	storage e volum		includin	ng any so	olar or W	/WHRS	storage	within sa	me ves	sel		0		(
						nter 110					<u> </u>	<u> </u>		(
	-	_			_			mbi boil	ers) ente	er '0' in (47)			
	storage					4.144	<i>(</i>					1		
•					or is kno	wn (kWł	n/day):					0		(
•		actor fro										0		(
			-	, kWh/ye		or is not		(48) x (49)	=		1	10		(
				-		h/litre/da					0.	02		(
		eating s			,		• /							
olume	e factor	from Tal	ole 2a								1.	03		(
empe	rature fa	actor fro	m Table	2b							0	.6		(
٠,			•	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(
inter ((50) or (54) in (5	55)								1.	03		(
ater	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
ylinde	er contains	dedicated	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendi	хH	
7)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(
iman	y circuit	loss (an	nual) fro	m Table	3							0		(
ııııaı	•	•	,			E0\	(EO) · 26	SE (44)						
-	y circuit	ioss car	cuiated i	or each	montn (ວອ)ກາ = ((30) - 30	DD X (41)	m					
imar	•				•	•	. ,	ng and a		r thermo	stat)			

Combi loss	calculated	for each	month ((61)m –	(60) ·	365 v (11	/m							
(61)m= 0	0	0	0	0 1)111 =	00) +	0) 0	I	0	0	0	0	1	(61)
										-			J · (59)m + (61)m	(- /
(62)m= 176.5	-	164.72	148.91	146.83	132.5	_	139.	_	138.51	154.35	161.64	172.72	1	(62)
Solar DHW inp]	(- /
(add addition										001111100	morrio wan	or modung)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	1	(63)
Output from	water hea	ter						!					1	
(64)m= 176.5		164.72	148.91	146.83	132.5	128.49	139.	29	138.51	154.35	161.64	172.72	1	
							(Outp	ut from wa	ater heat	er (annual) ₁	12	1820.5	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	85 × (45)m	ı + (6	1)m] + 0.8 x	: [(46)m	ı + (57)m	+ (59)m		-
(65)m= 84.5		80.61	74.52	74.66	69.06		72.1		71.06	77.16	78.75	83.27	1	(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinde	is in the	dwelli	ng d	or hot w	ater is	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):	-									
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar		Mar	Apr	May	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
(66)m= 84.5°	1 84.51	84.51	84.51	84.51	84.51	84.51	84.5	51	84.51	84.51	84.51	84.51		(66)
Ligh <mark>ting g</mark> air	ns (calcula	ted in A	pendix	L, equ <mark>a</mark> t	ion L9	or L9a), a	lso se	ee T	able 5		i e			
(67)m= 13.13	3 11.66	9.48	7.18	5.37	4.53	4.89	6.3	6	8.54	10.84	12.66	13.49		(67)
App <mark>liance</mark> s (gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation	L13 or L1	3 a), a	also	see Tal	ole 5			•	
(68)m= 147.2	23 148.76	144.91	136.72	126.37	116.6	1 110.15	108.	62	112.47	120.67	131.01	140.74		(68)
Cooking gai	ns (calcula	ited in A	ppendix	L, equat	ion L1	5 or L15a), also	o se	e Table	5		•	1	
(69)m= 31.4	5 31.45	31.45	31.45	31.45	31.45	31.45	31.4	15	31.45	31.45	31.45	31.45		(69)
Pumps and	fans gains	(Table 5	5a)					Ī					•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							-	•	
(71)m= -67.6	6 -67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.	.6	-67.6	-67.6	-67.6	-67.6]	(71)
Water heatir	ng gains (T	able 5)		-				_			-	-		
(72)m= 113.6	3 111.92	108.35	103.5	100.35	95.92	92.16	96.9	98	98.7	103.71	109.38	111.92]	(72)
Total intern	al gains =	1			(6	66)m + (67)m	า + (68)m +	(69)m + (70)m + (71)m + (72))m	-	
(73)m= 322.3	320.69	311.09	295.75	280.44	265.4	255.55	260.	32	268.06	283.58	301.4	314.5]	(73)
6. Solar ga	ins:													
Solar gains ar		•	r flux from	Table 6a		•	tions t	o cor	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			lux able 6a			g_ able 6b	_	FF able 6c		Gains (W)	
					, 		, ,	10			able oc			,
East 0.9		X	2.	6	x	19.64	X		0.53	× [0.7	=	13.13	(76)
East 0.9		X	4.		x	19.64	X		0.53	x	0.8	=	23.66	(76)
East 0.9		X	2.		x	38.42	X		0.53	x [0.7	=	25.68	(76)
East 0.9		X	4.		x	38.42	X		0.53	x [0.8	=	46.29	(76)
East 0.9	X 0.77	X	2.	6	Х	63.27	X		0.53	X	0.7	=	42.3	(76)

	_												_
East	0.9x	0.77	X	4.1	X	63.27	X	0.53	X	0.8	=	76.23	(76)
East	0.9x	0.77	X	2.6	x	92.28	x	0.53	X	0.7	=	61.69	(76)
East	0.9x	0.77	X	4.1	X	92.28	X	0.53	X	0.8	=	111.17	(76)
East	0.9x	0.77	X	2.6	X	113.09	x	0.53	X	0.7	=	75.6	(76)
East	0.9x	0.77	X	4.1	X	113.09	X	0.53	X	0.8	=	136.24	(76)
East	0.9x	0.77	X	2.6	X	115.77	x	0.53	X	0.7	=	77.39	(76)
East	0.9x	0.77	x	4.1	x	115.77	X	0.53	X	0.8	=	139.47	(76)
East	0.9x	0.77	x	2.6	x	110.22	x	0.53	X	0.7	=	73.68	(76)
East	0.9x	0.77	X	4.1	X	110.22	x	0.53	X	0.8	=	132.78	(76)
East	0.9x	0.77	x	2.6	x	94.68	x	0.53	X	0.7	=	63.29	(76)
East	0.9x	0.77	x	4.1	x	94.68	x	0.53	X	0.8	=	114.06	(76)
East	0.9x	0.77	x	2.6	x	73.59	x	0.53	X	0.7	=	49.19	(76)
East	0.9x	0.77	x	4.1	x	73.59	x	0.53	x	0.8	=	88.65	(76)
East	0.9x	0.77	x	2.6	x	45.59	x	0.53	x	0.7	=	30.47	(76)
East	0.9x	0.77	x	4.1	x	45.59	x	0.53	X	0.8	=	54.92	(76)
East	0.9x	0.77	x	2.6	x	24.49	x	0.53	X	0.7	=	16.37	(76)
East	0.9x	0.77	x	4.1	x	24.49	x	0.53	x	0.8	=	29.5	(76)
East	0.9x	0.77	x	2.6	X	16.15	Х	0.53	X	0.7	=	10.8	(76)
East	0.9x	0.77	x	4.1	x	16.15	x	0.53	x	0.8	=	19.46	(76)
South	0.9x	0.77	x	1.3	х	46.75	×	0.53	x	0.7	=	15.63	(78)
South	0.9x	0.77	x	1.3	x	76.57	x	0.53	x	0.7	=	25.59	(78)
South	0.9x	0.77	x	1.3	x	97.53	Х	0.53	x	0.7	=	32.6	(78)
South	0.9x	0.77	x	1.3	x	110.23	X	0.53	x	0.7	=	36.84	(78)
South	0.9x	0.77	x	1.3	х	114.87	x	0.53	x	0.7	=	38.39	(78)
South	0.9x	0.77	x	1.3	x	110.55	x	0.53	X	0.7	=	36.95	(78)
South	0.9x	0.77	x	1.3	x	108.01	x	0.53	X	0.7	=	36.1	(78)
South	0.9x	0.77	x	1.3	x	104.89	x	0.53	X	0.7	=	35.06	(78)
South	0.9x	0.77	x	1.3	x	101.89	x	0.53	X	0.7	=	34.05	(78)
South	0.9x	0.77	x	1.3	x	82.59	x	0.53	x	0.7	=	27.6	(78)
South	0.9x	0.77	x	1.3	x	55.42	x	0.53	X	0.7	=	18.52	(78)
South	0.9x	0.77	x	1.3	x	40.4	x	0.53	X	0.7	=	13.5	(78)
West	0.9x	0.77	x	1.9	x	19.64	x	0.53	X	0.8	=	10.96	(80)
West	0.9x	0.77	x	2.6	x	19.64	x	0.53	X	0.8	=	15	(80)
West	0.9x	0.77	x	1.9	x	38.42	x	0.53	X	0.8	=	21.45	(80)
West	0.9x	0.77	x	2.6	x	38.42	x	0.53	X	0.8	=	29.35	(80)
West	0.9x	0.77	x	1.9	x	63.27	x	0.53	X	0.8	=	35.32	(80)
West	0.9x	0.77	x	2.6	x	63.27	x	0.53	x	0.8	=	48.34	(80)
West	0.9x	0.77	x	1.9	x	92.28	x	0.53	x	0.8	=	51.52	(80)
West	0.9x	0.77	x	2.6	x	92.28	x	0.53	x	0.8	=	70.5	(80)
West	0.9x	0.77	х	1.9	x	113.09	x	0.53	X	0.8	=	63.14	(80)
West	0.9x	0.77	х	2.6	x	113.09	x	0.53	X	0.8	=	86.4	(80)

West	0.9x	0.77	X	1.	.9	X	11	15.77	X	0.	.53	x	0.8	-	- [64.63	(80)
West	0.9x	0.77	X	2.	.6	X	11	15.77	X	0.	.53	x	0.8		- [88.44	(80)
West	0.9x	0.77	X	1.	.9	X	11	10.22	X	0.	.53	x	0.8	-	= [61.53	(80)
West	0.9x	0.77	X	2.	.6	X	11	10.22	x	0.	.53	x	0.8		= [84.2	(80)
West	0.9x	0.77	X	1.	.9	X	9	4.68	x	0.	.53	x	0.8	=	= [52.86	(80)
West	0.9x	0.77	X	2.	.6	X	9	4.68	x	0.	.53	x	0.8	-	= [72.33	(80)
West	0.9x	0.77	X	1.	.9	X	7	3.59	x	0.	.53	x	0.8	-	- [41.08	(80)
West	0.9x	0.77	X	2.	.6	X	7	3.59	x	0.	.53	x	0.8	-	= [56.22	(80)
West	0.9x	0.77	X	1.	.9	X	4	5.59	x	0.	.53	x	0.8	-	= [25.45	(80)
West	0.9x	0.77	X	2.	.6	X	4	5.59	x	0.	.53	x	0.8	=	= [34.83	(80)
West	0.9x	0.77	X	1.	.9	X	2	4.49	X	0.	.53	x	0.8	=	= [13.67	(80)
West	0.9x	0.77	X	2.	.6	X	2	4.49	X	0.	.53	x	0.8	=	- [18.71	(80)
West	0.9x	0.77	X	1.	.9	X	1	6.15	x	0.	.53	x	0.8	=	= [9.02	(80)
West	0.9x	0.77	X	2.	.6	X	1	6.15	x	0.	.53	x	0.8	=	= [12.34	(80)
Solar ga	ains in	watts, ca	lculated	for eac	h montl	<u>1</u>			(83)m	= Sum	(74)m	.(82)m			_		
(83)m=	78.39	148.36	234.78	331.72	399.77		06.88	388.3	337	.59 2	269.2	173.28	96.78	65.11			(83)
Total ga	ains – i	nternal ar		` ′	= (73)m			, watts							_		
(84)m=	400.73	469.05	545.88	627.46	680.21	6	72.33	643.85	597	.91 5:	37.26	456.86	398.18	379.62	2		(84)
7. Mea	an inter	rnal temp	erature	(hea <mark>tin</mark> g	g seaso	n)											
Tempe	erature	during he	eating p	eriods i	n the liv	ing	area f	rom Tak	ole 9.	Th1 (°C)				Γ	21	(85)
								TOTAL TOLK	,,	(()				- 1		' '
Utilisat	tion fac	ctor for ga	ins for	iving ar	ea, h1,r	_					,				_L 		``
Utilisat	tion fac Jan	ctor for ga	nins for Mar	iving ar Apr	ea, h1,r May	n (s					Sep	Oct	Nov	Dec			
Utilisat						n (s	ee Ta	ble 9a)		ıg	·	Oct 0.86	Nov 0.98	Dec			(86)
(86)m=	Jan 0.99	Feb	Mar 0.92	Apr 0.78	May 0.59	n (s	ee Ta Jun 0.41	Jul 0.29	Au 0.3	g	Sep 0.55	_	_				
(86)m=	Jan 0.99	Feb 0.97	Mar 0.92	Apr 0.78	May 0.59	n (s	ee Ta Jun 0.41	Jul 0.29	Au 0.3	able 9	Sep 0.55	_	0.98				
(86)m= Mean i (87)m=	Jan 0.99 interna 20.3	7 Feb 0.97 lt tempera 20.48	0.92 ature in 20.71	0.78 living ar 20.92	0.59 ea T1 (1	n (s	ee Ta Jun 0.41 ow ster 21	Jul 0.29 ps 3 to 7 21	0.3 7 in T	able 9	Sep 0.55 0c) 20.99	0.86	0.98	0.99			(86)
(86)m= Mean i (87)m=	Jan 0.99 interna 20.3	Feb 0.97	0.92 ature in 20.71	0.78 living ar 20.92	0.59 ea T1 (1	n (s	ee Ta Jun 0.41 ow ster 21	Jul 0.29 ps 3 to 7 21	0.3 7 in T	able 9 2 2), Th2	Sep 0.55 0c) 20.99	0.86	0.98	0.99			(86)
(86)m= Mean i (87)m= Tempe (88)m=	Jan 0.99 interna 20.3 erature 20.17	Feb 0.97 Il tempera 20.48 during he 20.17	Mar 0.92 ature in 20.71 eating p	Apr 0.78 living ar 20.92 eriods i 20.18	May 0.59 rea T1 (1 20.99 n rest o	follo	ee Ta Jun 0.41 ww ster 21 velling 20.2	Jul 0.29 ps 3 to 7 21 from Ta 20.2	0.37 in T 2°	able 9 2 2), Th2	Sep 0.55 0c) 0c.	20.88	0.98	0.99			(86)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat	Jan 0.99 interna 20.3 erature 20.17 tion fac	Feb 0.97 Il tempera 20.48 during he 20.17 ctor for ga	Mar 0.92 ature in 20.71 eating p 20.17	Apr 0.78 living ar 20.92 eriods i 20.18	May 0.59 ea T1 (i 20.99 n rest o 20.19 welling,	follo	ee Ta Jun 0.41 www.ste 21 velling 20.2 m (see	Jul 0.29 ps 3 to 7 21 from Ta 20.2 pe Table	Au 0.3 7 in T 2 9able 9 20.	able 9 7 7 7 7 7 7 7 7 7 7 7 7 7	Sep 0.55 00.99 00.99 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 00.19 0	20.88	0.98 20.55 20.18	0.99 20.27 20.18			(86) (87) (88)
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Useful gains, hmGm, W = (94)m x (84)m (95)m= 394.76 452.49 494.19 475.15 381.81 255.57 169.63 177.68 276.92 381.51 384.39 375.28	95)
(95)m= 394.76 452.49 494.19 475.15 381.81 255.57 169.63 177.68 276.92 381.51 384.39 375.28 Monthly average external temperature from Table 8	93)
	96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
(97)m= 693.23 673.96 613.2 508.08 386.72 255.91 169.66 177.74 279.06 430 570.37 687.12	97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 222.06 148.83 88.54 23.71 3.65 0 0 0 36.08 133.91 232.01	00)
	98)
Space heating requirement in kWh/m²/year 17.78	99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0	301)
	302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	
Fraction of heat from Community boilers	303a)
Fraction of total space heat from Community boilers (302) x (303a) =	304a)
Factor for control and charging method (Table 4c(3)) for community heating system	305)
Distribution loss factor (Table 12c) for community heating system 1.05	306)
Space heating kWh/year	
Annual space heating requirement 888.78	
Space heat from Community boilers (98) x (304a) x (305) x (306) = 933.22 (3	307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = 0	309)
Water heating	
Annual water heating requirement 1820.5	
If DHW from community scheme: Water heat from Community boilers (64) x (303a) x (305) x (306) = 1911.52	310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = 28.45$	313)
Cooling System Energy Efficiency Ratio	314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$ 0	315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	330a)
	330b)
	330g)
	331)
	332)
12b. CO2 Emissions – Community heating scheme	

Energy

kWh/year

kg CO2/year

Emission factor Emissions

kg CO2/kWh

CO2 from other sources of space and water Efficiency of heat source 1 (%)	heating (not CHP) If there is CHP using two fuels repeat (363) to (3	666) for the secon	d fuel	90	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	= [682.74	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [14.76	(372)
Total CO2 associated with community system	ns (363)(366) + (368)(372)		= [697.5	(373)
CO2 associated with space heating (secondary	ary) (309) x	0	= [0	(374)
CO2 associated with water from immersion h	neater or instantaneous heater (312) x	0.22	= [0	(375)
Total CO2 associated with space and water h	heating (373) + (374) + (375) =			697.5	(376)
CO2 associated with electricity for pumps and	d fans within dwelling (331)) x	0.52	= [67.59	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= [120.31	(379)
Total CO2, kg/year	of (376)(382) =			885.4	(383)
Dwelling CO2 Emission Rate (383)) ÷ (4) =			17.71	(384)
El rating (section 14)				87.51	(385)



		User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Versic	on: 1.0.4.26	
			Address:						
Address: 1. Overall dwelling dimer	The Charlie Ratchford Cent	re, Belm	ont Stree	et, LONI	DON, NV	V1 8HF			
r. Overall dwelling dime	nsions.	Δτο:	a(m²)		Av. Hei	iaht(m)		Volume(m ³	3)
Ground floor			``	(1a) x		2.8	(2a) =	140) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	50	(4)					
Dwelling volume		· L)+(3c)+(3d	l)+(3e)+	.(3n) =	140	(5)
2. Ventilation rate:									
2. Voltmanori fato.	main seconda	ry	other		total			m³ per hou	r
Number of chimneys	heating heating 0 + 0	+ [0	=	0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	j = F	0	x 2	20 =	0	(6b)
Number of intermittent far	ns			, <u> </u>	2	x :	10 =	20	(7a)
Number of passive vents				Ī	0	x :	10 =	0	(7b)
Number of flueless gas fir	res			Ī	0	X 4	40 =	0	(7c)
				_			Air ch	nanges per ho	— our
Infiltration due to chimne	vs, flues and fans = (6a)+(6b)+(7a)+(7b)+((7c) =	Г	20				(8)
	een carried out or is intended, procee			ontinue fr			÷ (5) =	0.14	(0)
Number of storeys in th	e dw <mark>elling</mark> (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame o				uction			0	(11)
if both types of wall are pro deducting areas of openin	esent, use the value corresponding to as): if equal user 0.35	o the great	ter wall area	a (after					
,	oor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) +	+ (15) =		0	(16)
•	q50, expressed in cubic metre	•	•	•	etre of e	nvelope	area	5	(17)
·	ty value, then $(18) = [(17) \div 20] + ($							0.39	(18)
	s if a pressurisation test has been do	ne or a deg	gree air per	meability	is being us	sed			¬
Number of sides sheltered Shelter factor	u		(20) = 1 - [0.0 75 x (1	19)1 =			2	(19)
Infiltration rate incorporati	ng shelter factor		(21) = (18)		-/1			0.85	(21)
Infiltration rate modified for	_		((- /				0.33	
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	1 . 1 . 1							ı	
 	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
	N 4	1			I	ı	1	I	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	· 	0.05		1	1.00	1 10	1 10		
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	I	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39	1	
Calculate effec	tive air	change i	rate for t	he appli	cable ca	se	l	1			!	<u></u>	
If mechanica												0	(23a
If exhaust air he) = (23a)			0	(23b
If balanced with	heat reco	very: effic	ency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(230
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a
b) If balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		,	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b
c) If whole he if (22b)m				-	-				.5 × (23t	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural v				•					0.5]			•	
(24d)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58]	(24d
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	· (25)		•	•	-	
(25)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
3. Heat losses	and he	at loss i	naram e t	or.									_
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value		A X k kJ/K
Doors Type 1					2.5	x	1.2	= [3	$\stackrel{\prime}{\Box}$			(26)
Doors Type 2					2.5	X	1,2		3	Ħ			(26)
Windows Type	1				0.78	X 1	/[1/(1.4)+	0.041 =	1.03	Ħ			(27)
Windows Type					1.56		/[1/(1.4)+		2.07	4			(27)
Windows Type					1.14	_	/[1/(1.4)+	L		=			(27)
Windows Type Windows Type						=	/[1/(1.4)+	Ļ	1.51	\dashv			
Windows Type					2.46	_	/[1/(1.4)+	L	3.26	=			(27)
• •					1.56	=			2.07	ᆗ ,			(27)
Walls Tatalogue (al	67.7		12.5		55.26	=	0.18	= [9.95				(29)
Total area of el					67.76		. former de d	1/// // /				- 22	(31)
* for windows and ** include the area						atea using	i tormula 1	/[(1/U-vaiu	ie)+0.04] a	as given in	paragrapi	7 3.2	
Fabric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				25.8	9 (33)
Heat capacity (Cm = S(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	ter (TMF	o = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used instea				construct	ion are not	t known pr	ecisely the	; indicative	values of	TMP in Ta	able 1f		
Thermal bridge	s : S (L	x Y) cal	culated ι	using Ap	pendix ł	<						3.38	(36)
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	· (36) =			29.2	7 (37)
Ventilation hea	ıt loss ca	alculated	l monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 27.29	27.12	26.97	26.22	26.08	25.42	25.42	25.3	25.68	26.08	26.36	26.66	1	(38)
Heat transfer c	oefficier:	nt. W/K			•		•	(39)m	= (37) + (37)	38)m	•	-	
		,						(-)	· / (•			
(39)m= 56.56	56.4	56.24	55.49	55.35	54.7	54.7	54.58	54.95	55.35	55.64	55.93		

Ugot logo poros	motor (l	JI D) \\\	/m21/					(40)m	(20)m .	(4)			
Heat loss parar	1.13	1.12	1.11	1.11	1.09	1.09	1.09	1.1	= (39)m ÷	1.11	1.12		
(40)111= 1.13	1.13	1.12	1.11	1.11	1.09	1.09	1.09			<u> </u>		1.11	(40)
Number of day	s in mo	nth (Tabl	le 1a)					,	Average =	: Sum(40) _{1.}	12 / 12=	1.11	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
L1						!	Į.		<u> </u>	•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	pancy, l	N								1.	69		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)			
Annual average	e hot wa										.34		(43)
Reduce the annual	-				-	-	to achieve	a water us	se target o	of ^t		l	
not more that 125					lot and co						1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	litres pei			Va,m = ta	ctor trom	i able 1c x	(43) 1					l	
(44)m= 81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77		_
Energy content of	hot water	used cal	culated m	onthly - 1	100 v Vd r	n v nm v F	Tm / 2600			ım(44) ₁₁₂ =		892.08	(44)
									,				
(45)m= 121.27	106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44		(45)
If instantaneous wa	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =		1169.66	(45)
(46)m= 18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62		(46)
Water storage		10.12	11.01	10.70	11.00	0.00	12.0	12.10	11.00	10.22	17.02		(- /
Storage volume	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community he	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufactu	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost from		_	-				(48) x (49)) =		0.	75		(50)
b) If manufactu			-									· I	
Hot water stora	-			e 2 (KW	n/litre/da	ay)					0		(51)
If community he Volume factor f	•		on 4.3								0		(52)
Temperature fa			2h							_	0		(52)
Energy lost from				oor			(47) v (51)) x (52) x (53) –				, ,
Enter (50) or (_	, KVVII/yt	Jai			(47) X (01)) X (02) X (00) =	-	0 75		(54) (55)
Water storage	, ,	,	or each	month			((56)m = (55) × (41)ı	m	<u> </u>	70		()
					00.50		·		ı	1 00 50	00.00		(EC)
(56)m= 23.33 If cylinder contains	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)ı	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 (H11) is fro	23.33 m Append	ix H	(56)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	noual) fro	m Table	. 3							0		(58)
Primary circuit	•	•			59)m = ((58) ± 36	35 × (41)	m			-		(/
(modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
` '											'-		. ,

Combi loss	salaulatad	for oach	, month	(61)m –	(60) · '	265 v (41	/m							
(61)m= 0	0	0	0	01)111 =	00) + \	000 x (41)III 0		0	0	0	0	1	(61)
								!] · (59)m + (61)m	(0.)
(62)m= 167.8		156.04	140.51	138.15	124.1	119.81	130.	_	130.11	145.67	153.24	164.04]	(62)
Solar DHW inpo		<u> </u>	1										J	(-)
(add addition											ion to wat	or riodairig)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from	water hea	ter	•			_ I	!				·		J	
(64)m= 167.8	_	156.04	140.51	138.15	124.1	119.81	130.	.61	130.11	145.67	153.24	164.04]	
		!		l .	<u> </u>	- I		Outp	ut from wa	ater heate	er (annual)	12	1718.27	(64)
Heat gains f	om water	heating	, kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	า + (6	1)m	ı] + 0.8 x	c [(46)m	+ (57)m	+ (59)m		_
(65)m= 77.6		73.67	67.8	67.72	62.34	61.62	65.2	_	64.34	70.22	72.03	76.33]	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwelli	ing (or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table :	5 and 5a):	•									
Metabolic ga														
Jar		Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(66)m= 84.5°	84.51	84.51	84.51	84.51	84.51	84.51	84.5	51	84.51	84.51	84.51	84.51		(66)
Ligh <mark>ting g</mark> air	s (calcula	ted in A	ppendix	L, equ <mark>a</mark> t	ion L9	or L9a), a	ilso s	ee T	Table 5					
(67)m= 13.24	11.76	9.56	7.24	5.41	4.57	4.94	6.4	2	8.61	10.94	12.76	13.61		(67)
App <mark>liance</mark> s (gains (ca <mark>lc</mark>	ulated i	n Append	dix L, eq	uation	_13 or L1	3 a), a	also	see Ta	ble 5				
(68)m= 147.2	3 148.76	144.91	136.72	126.37	116.64	110.15	108.	.62	112.47	120.67	131.01	140.74		(68)
Cooking gain	ns (calcula	ited in A	ppendix	L, equat	ion L1	or L15a), also	o se	e Table	5				
(69)m= 31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.4	45	31.45	31.45	31.45	31.45		(69)
Pumps and	ans gains	(Table	5a)										-	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							-		
(71)m= -67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67	.6	-67.6	-67.6	-67.6	-67.6		(71)
Water heating	ng gains (T	able 5)											_	
(72)m= 104.3	3 102.58	99.01	94.17	91.02	86.59	82.82	87.6	65	89.36	94.38	100.05	102.59		(72)
Total intern	al gains =	:			(6	6)m + (67)n	n + (68	8)m +	- (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 316.1	2 314.45	304.84	289.47	274.15	259.15	249.26	254.	.04	261.8	277.33	295.17	308.28		(73)
6. Solar ga	ns:													
Solar gains ar		•					ations t	to co		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		T:	g_ able 6b	т	FF able 6c		Gains (W)	
Foot					_		1 r						. ,	7,,
East 0.9		X			X	19.64] X [0.63	╣ ^ϫ ╞	0.7	=	9.36	 (76)
East 0.9		X			X	19.64	X [0.63	_ ×	0.7	=	14.77	 (76)
East 0.9		X			x	38.42]		0.63	×	0.7	=	18.32	 (76)
East 0.9		Х	2.4	16	x	38.42]		0.63	_ ×	0.7	=	28.88	(76)
	0.77	X	1.5		X	63.27	X		0.63	X	0.7	=	30.17	(76)

	_												_
East	0.9x	0.77	X	2.46	X	63.27	Х	0.63	X	0.7	=	47.57	(76)
East	0.9x	0.77	x	1.56	x	92.28	X	0.63	X	0.7	=	44	(76)
East	0.9x	0.77	X	2.46	X	92.28	X	0.63	X	0.7	=	69.38	(76)
East	0.9x	0.77	X	1.56	x	113.09	x	0.63	X	0.7	=	53.92	(76)
East	0.9x	0.77	X	2.46	x	113.09	X	0.63	X	0.7	=	85.02	(76)
East	0.9x	0.77	X	1.56	X	115.77	X	0.63	X	0.7	=	55.19	(76)
East	0.9x	0.77	X	2.46	x	115.77	X	0.63	X	0.7	=	87.04	(76)
East	0.9x	0.77	x	1.56	x	110.22	x	0.63	X	0.7	=	52.55	(76)
East	0.9x	0.77	x	2.46	X	110.22	X	0.63	X	0.7	=	82.86	(76)
East	0.9x	0.77	x	1.56	x	94.68	x	0.63	X	0.7] =	45.14	(76)
East	0.9x	0.77	x	2.46	x	94.68	x	0.63	X	0.7	=	71.18	(76)
East	0.9x	0.77	x	1.56	x	73.59	x	0.63	X	0.7	=	35.08	(76)
East	0.9x	0.77	x	2.46	x	73.59	x	0.63	x	0.7	=	55.32	(76)
East	0.9x	0.77	x	1.56	x	45.59	x	0.63	x	0.7	=	21.73	(76)
East	0.9x	0.77	x	2.46	x	45.59	x	0.63	x	0.7	=	34.27	(76)
East	0.9x	0.77	x	1.56	x	24.49	x	0.63	X	0.7	=	11.68	(76)
East	0.9x	0.77	x	2.46	x	24.49	x	0.63	x	0.7	=	18.41	(76)
East	0.9x	0.77	x	1.56	X	16.15	Х	0.63	X	0.7	=	7.7	(76)
East	0.9x	0.77] x	2.46	x	16.15	x	0.63	x	0.7	=	12.14	(76)
South	0.9x	0.77] x	0.78	х	46.75	×	0.63	x	0.7	=	11.14	(78)
South	0.9x	0.77	x	0.78	x	76.57	x	0.63	x	0.7	=	18.25	(78)
South	0.9x	0.77	x	0.78	х	97.53	Х	0.63	x	0.7	=	23.25	(78)
South	0.9x	0.77	x	0.78	x	110.23	X	0.63	x	0.7	=	26.28	(78)
South	0.9x	0.77	x	0.78	х	114.87	x	0.63	x	0.7	=	27.38	(78)
South	0.9x	0.77	x	0.78	x	110.55	x	0.63	X	0.7	=	26.35	(78)
South	0.9x	0.77	x	0.78	x	108.01	x	0.63	X	0.7	=	25.75	(78)
South	0.9x	0.77	x	0.78	x	104.89	x	0.63	X	0.7	=	25	(78)
South	0.9x	0.77	x	0.78	x	101.89	x	0.63	X	0.7	=	24.29	(78)
South	0.9x	0.77	x	0.78	x	82.59	x	0.63	x	0.7	=	19.69	(78)
South	0.9x	0.77	x	0.78	x	55.42	x	0.63	x	0.7	=	13.21	(78)
South	0.9x	0.77	x	0.78	x	40.4	x	0.63	X	0.7	=	9.63	(78)
West	0.9x	0.77	x	1.14	x	19.64	X	0.63	X	0.7	=	6.84	(80)
West	0.9x	0.77	x	1.56	x	19.64	x	0.63	X	0.7	=	9.36	(80)
West	0.9x	0.77	x	1.14	x	38.42	X	0.63	X	0.7	=	13.39	(80)
West	0.9x	0.77	x	1.56	x	38.42	X	0.63	X	0.7	=	18.32	(80)
West	0.9x	0.77	x	1.14	x	63.27	x	0.63	x	0.7	=	22.04	(80)
West	0.9x	0.77	x	1.56	x	63.27	x	0.63	x	0.7] =	30.17	(80)
West	0.9x	0.77	x	1.14	x	92.28	х	0.63	x	0.7	=	32.15	(80)
West	0.9x	0.77	×	1.56	x	92.28	x	0.63	x	0.7] =	44	(80)
West	0.9x	0.77	x	1.14	x	113.09	x	0.63	x	0.7] =	39.4	(80)
West	0.9x	0.77	x	1.56	x	113.09	x	0.63	x	0.7] =	53.92	(80)
	_		•		•		•				•		-

West	0.9x	0.77	X	1.1	14	X	1	15.77	x		0.63	x	0.7		=	4	0.33	(80)
West	0.9x	0.77	x	1.5	56	X	1	15.77	x		0.63	x	0.7		=	5	5.19	(80)
West	0.9x	0.77	x	1.1	14	X	1	10.22	x		0.63	x	0.7		=	;	38.4	(80)
West	0.9x	0.77	x	1.5	56	X	1	10.22	x		0.63	×	0.7		=	5	2.55	(80)
West	0.9x	0.77	X	1.1	14	X	9	4.68	X		0.63	x	0.7		=	3	2.98	(80)
West	0.9x	0.77	x	1.5	56	X	9	4.68	x		0.63	x	0.7		=	4	5.14	(80)
West	0.9x	0.77	x	1.1	14	X	7	'3.59	x		0.63	×	0.7		=	2	5.64	(80)
West	0.9x	0.77	x	1.5	56	X	7	3.59	x		0.63	x	0.7		=	3	5.08	(80)
West	0.9x	0.77	X	1.1	14	X	4	5.59	X		0.63	x	0.7		=	1	5.88	(80)
West	0.9x	0.77	X	1.5	56	X	4	5.59	x		0.63	x	0.7		=	2	1.73	(80)
West	0.9x	0.77	X	1.1	14	X	2	4.49	x		0.63	×	0.7		=	8	3.53	(80)
West	0.9x	0.77	X	1.5	56	X	2	4.49	X		0.63	×	0.7		=	1	1.68	(80)
West	0.9x	0.77	X	1.1	14	X	1	6.15	X		0.63	×	0.7		=	Į.	5.63	(80)
West	0.9x	0.77	X	1.5	56	X	1	6.15	X		0.63	x	0.7		=		7.7	(80)
									_									
Solar ga	ains in	watts, ca	lculated	for eac	h month	1			(83)m	ı = Su	m(74)m .	(82)m						
(83)m=	51.48	97.16	153.2	215.79	259.64	26	64.11	252.11	219	.44	175.42	113.3	1 63.5	42	2.8			(83)
Total ga	ins – ir	nternal a	nd solar	(84)m =	= (73)m	+ (8	83)m	, watts						,				
(84)m=	367.6	411.61	458.03	505.27	533.79	52	23.26	501.36	473	.48	437.22	390.6	5 358.68	35′	1.08			(84)
7. Mea	n inter	nal temp	erature	(heating	seasor				A									
Tempe	rature	during he	eating p	eriods ir	n the livi	ing	area 1	from Tak	ble 9	Th1	(°C)						21	(85)
											,							
Utilisat	<mark>io</mark> n fac	tor for ga	ains for l	living are	ea, h1,n	n (s	ee Ta	ble 9a)										
Util <mark>isat</mark>	<mark>io</mark> n fac Jan	tor for ga	ains for Mar	living are	ea, h1,n May		ee Ta Jun	ble 9a) Jul	A	ug	Sep	Oct	Nov		Эес			
Utilisat (86)m=		Ī				Ĺ			A 0.5	ug		Oct	Nov 0.99	+-)ec 1			(86)
(86)m=	Jan 0.99	Feb 0.99	Mar 0.98	Apr 0.93	May 0.82		Jun 0.64	Jul 0.47	0.5	ug 52	Sep 0.77	_	_	+-				(86)
(86)m=	Jan 0.99	Feb	Mar 0.98	Apr 0.93	May 0.82	ollo	Jun 0.64	Jul 0.47	0.5	ug 52 able	Sep 0.77	_	0.99					(86)
(86)m= Mean i	Jan 0.99 nternal 19.91	0.99 l tempera 20.06	0.98 ature in 20.31	Apr 0.93 living are 20.62	0.82 ea T1 (f	follo 2	Jun 0.64 ow ste 20.97	Jul 0.47 ps 3 to 7 20.99	0.5 7 in T 20.	ug 52 able	Sep 0.77 9c) 20.92	0.95	0.99		1			` ,
(86)m= Mean i (87)m= Tempe	Jan 0.99 nternal 19.91	Feb 0.99	0.98 ature in 20.31	Apr 0.93 living are 20.62	0.82 ea T1 (f	follo 2	Jun 0.64 ow ste 20.97	Jul 0.47 ps 3 to 7 20.99	0.5 7 in T 20.	ug 52 able 99 7, Th	Sep 0.77 9c) 20.92	0.95	0.99	19	1			` ,
(86)m= Mean i (87)m= Tempe (88)m=	Jan 0.99 nternal 19.91 erature 19.98	Feb 0.99 I tempera 20.06 during he 19.98	Mar 0.98 ature in 20.31 eating p	Apr 0.93 living ard 20.62 periods in 19.99	0.82 ea T1 (f 20.86 rest of	follo 2 dw	Jun 0.64 ow ste 20.97 velling 20.01	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01	0.57 in T 20.	ug 52 able 99 7, Th	Sep 0.77 9c) 20.92 2 (°C)	20.61	0.99	19	.89			(87)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat	Jan 0.99 nternal 19.91 erature 19.98 ion fac	Feb 0.99 tempera 20.06 during he 19.98 tor for ga	Mar 0.98 ature in 20.31 eating p 19.98	Apr 0.93 living are 20.62 periods in 19.99	May 0.82 ea T1 (f 20.86 rest of 20 welling,	follo 2 f dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01	0.57 in T 20. able 9 20.	ug 52 able 99 7, Th	Sep 0.77 9c) 20.92 2 (°C) 20	20.61	0.99 20.21 19.99	19	.89			(87)
(86)m=	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99	Mar 0.98 ature in 20.31 eating p 19.98 ains for 1 0.97	Apr 0.93 living ard 20.62 periods in 19.99 rest of d 0.91	May 0.82 ea T1 (f 20.86 rest of 20 welling, 0.77	follo 2 dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37	0.57 in T 20. able 9 20. 920. 920.	ug 52 52 52 54 54 54 54 54	Sep 0.77 9c) 20.92 2 (°C) 20	20.61 20 0.93	0.99	19	.89			(87)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i	Jan 0.99 nternal 19.91 rature 19.98 ion fac 0.99 nternal	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera	Mar 0.98 ature in 20.31 eating p 19.98 ains for 0.97 ature in	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell	dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste	0.57 in T 20.22 able 9 20.22 eps 3	ug 52 able 99 5, Th 01 5 to 7	Sep 0.77 20.92 2 (°C) 20 0.69 in Tabl	20.61 20 0.93 e 9c)	0.99 20.21 19.99 0.99	19	.89			(87) (88) (89)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99	Mar 0.98 ature in 20.31 eating p 19.98 ains for 1 0.97	Apr 0.93 living ard 20.62 periods in 19.99 rest of d 0.91	May 0.82 ea T1 (f 20.86 rest of 20 welling, 0.77	dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37	0.57 in T 20. able 9 20. 920. 920.	ug 52 able 99 5, Th 01 5 to 7	Sep 0.77 9c) 20.92 2 (°C) 20 0.69 in Tabl 19.94	20.61 20 0.93 e 9c) 19.56	0.99 20.21 19.99 0.99	19	.89			(87) (88) (89) (90)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i	Jan 0.99 nternal 19.91 rature 19.98 ion fac 0.99 nternal	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera	Mar 0.98 ature in 20.31 eating p 19.98 ains for 0.97 ature in	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell	dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste	0.57 in T 20.22 able 9 20.22 eps 3	ug 52 able 99 5, Th 01 5 to 7	Sep 0.77 9c) 20.92 2 (°C) 20 0.69 in Tabl 19.94	20.61 20 0.93 e 9c) 19.56	0.99 20.21 19.99 0.99	19	.89		0.42	(87) (88) (89)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m=	Jan 0.99 nterna 19.91 rature 19.98 ion fac 0.99 nterna 18.54	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera	Mar 0.98 ature in 20.31 eating p 19.98 ains for 1 0.97 ature in 19.11	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest 19.56	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell 19.86	follo 2 follo 2 h2, (ling 1	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55 T2 (fo	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste	0.57 in T 20. able 9 20. e 9a) 0.4	ug	Sep 0.77 20.92 2 (°C) 20 0.69 in Tabl 19.94	20.61 20 0.93 e 9c) 19.56	0.99 20.21 19.99 0.99	19	.89	().42	(87) (88) (89) (90)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m=	Jan 0.99 nterna 19.91 rature 19.98 ion fac 0.99 nterna 18.54	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75	Mar 0.98 ature in 20.31 eating p 19.98 ains for 1 0.97 ature in 19.11	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest 19.56	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell 19.86	f dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55 T2 (fo	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste	0.57 in T 20. able 9 20. e 9a) 0.4	ug 52 able 99 52, Th 01 54 to 7 0 54 64 64 64 64 64 64 64 64 64 64 64 64 64	Sep 0.77 20.92 2 (°C) 20 0.69 in Tabl 19.94	20.61 20 0.93 e 9c) 19.56	0.99 20.21 19.99 0.99	19 19 0.	.89	(0.42	(87) (88) (89) (90)
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(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m=	Jan 0.99 nterna 19.91 rature 19.98 ion fac 0.99 nterna 18.54 nterna 19.11 adjustn 19.11	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75 I tempera 19.29 nent to th 19.29	Mar 0.98 ature in 20.31 eating p 19.98 ains for i 0.97 ature in 19.11 ature (for 19.61 ne mean 19.61	Apr 0.93 living are 20.62 periods ir 19.99 rest of d 0.91 the rest 19.56 or the wh 20 n interna	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell 19.86	folloo	Jun 0.64 ow ste 20.97 velling 20.01 m (se 0.55 T2 (fo 19.99 g) = fl 20.4	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste 20 LA × T1 20.42	0.57 in T 20. able 9 20. able 1 2	ug 52 able 99 52 Table 90 52 T	Sep 0.77 29c) 20.92 2 (°C) 20 0.69 in Tabl 19.94 f A) × T2 20.35	0.95 20.61 20 0.93 e 9c) 19.56 LA = Lin	0.99 20.21 19.99 0.99 18.98 ving area ÷	19 19 0. 18 (4) =	.89		0.42	(87) (88) (89) (90) (91)
Mean i (86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Space	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99 nternal 18.54 nternal 19.11 adjustn 19.11 ce hea	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75 I tempera 19.29 hent to th 19.29 ting requ	Mar 0.98 ature in 20.31 eating p 19.98 ains for 1 0.97 ature in 19.11 ature (for 19.61 ne mean 19.61 irement	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest 19.56 or the wh 20 n interna 20	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell 19.86 cole dwe 20.27 I temper 20.27	follo 2 follo 2 follo 2 follo 2 follo 2 follo 3 follo 4 follo 4 follo 4 follo 5 follo 6 follo 6 follo 6 follo 7 follo	Jun 0.64 ow ste 20.97 velling 20.01 m (se 0.55 T2 (fo 19.99 g) = fl 20.4 ure fro 20.4	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste 20 LA × T1 20.42 m Table 20.42	0.57 in T 20. able \$ 2	ug 52 able 99 52 Table 90 52 T	Sep 0.77 29c) 20.92 2 (°C) 20 0.69 in Tabl 19.94 f A) × T2 20.35 re appro- 20.35	20.61 20 0.93 e 9c) 19.56 LA = Liv	0.99 20.21 19.99 0.99 18.98 ving area ÷	19 19 0. 18 (4) =	.89 .99 .51 .08		0.42	(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Space Set Tit	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99 nternal 18.54 nternal 19.11 adjustn 19.11 ce hea to the r	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75 I tempera 19.29 nent to th 19.29 ting required	Mar 0.98 ature in 20.31 eating p 19.98 ains for on 0.97 ature in 19.11 ature (for 19.61 are mean 19.61 irement ernal ter	Apr 0.93 living are 20.62 periods ir 19.99 rest of d 0.91 the rest 19.56 or the wh 20 n interna	May 0.82 ea T1 (f 20.86 rest of 20 welling, 0.77 of dwell 19.86 cole dwe 20.27 I tempe 20.27	follo 2 follo 2 follo 2 follo 2 follo 2 follo 3 follo 4 follo 4 follo 4 follo 5 follo 6 follo 6 follo 6 follo 7 follo	Jun 0.64 ow ste 20.97 velling 20.01 m (se 0.55 T2 (fo 19.99 g) = fl 20.4 ure fro 20.4	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste 20 LA × T1 20.42 m Table 20.42	0.57 in T 20. able \$ 2	ug 52 able 99 52 Table 90 52 T	Sep 0.77 29c) 20.92 2 (°C) 20 0.69 in Tabl 19.94 f A) × T2 20.35 re appro- 20.35	20.61 20 0.93 e 9c) 19.56 LA = Liv	0.99 20.21 19.99 0.99 18.98 ving area ÷	19 19 0. 18 (4) =	.89 .99 .51 .08		0.42	(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Space Set Tit	Jan 0.99 nternal 19.91 rature 19.98 ion fac 0.99 nternal 18.54 nternal 19.11 adjustn 19.11 ce hea to the r isation	tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75 I tempera 19.29 hent to th 19.29 ting requences	Mar 0.98 ature in 20.31 eating p 19.98 ains for 0.97 ature in 19.11 ature (for 19.61 are mean 19.61 irement ernal ter r gains	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest 19.56 or the wh 20 minterna 20 mperaturusing Ta	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell 19.86 aole dwe 20.27 I tempe 20.27 re obtainable 9a	follo 2 follo 2 h2, h2, follo 1 raturaturaturaturaturaturaturaturaturatu	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55 T2 (fd 9.99 g) = fl 20.4 ure fro 20.4	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste 20 LA × T1 20.42 m Table 20.42 ep 11 of	0.57 in T 20. able 9 2	ug 52 52 53 54 55 55 55 55 55 55	Sep 0.77 29c) 20.92 2 (°C) 20 0.69 in Tabl 19.94 f A) × T2 20.35 re appro 20.35 , so tha	0.95 20.61 20 0.93 e 9c) 19.56 LA = Livitation 20 opriate 20 t Ti,m:	0.99 20.21 19.99 0.99 18.98 ving area ÷ 19.49 =(76)m ar	19 19 0. 18 (4) =	.89 .99 .51		0.42	(87) (88) (89) (90) (91)
Mean i (86)m= Mean i (87)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= Set Ti t the utili	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99 nternal 18.54 nternal 19.11 adjustn 19.11 ce hea to the r isation Jan	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75 I tempera 19.29 ment to th 19.29 ting requirement interfactor fo Feb	Mar 0.98 ature in 20.31 eating p 19.98 ains for 0.97 ature in 19.11 ature (for 19.61 irement ernal ter r gains Mar	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest 19.56 or the wh 20 n interna 20 mperaturusing Tal	May 0.82 ea T1 (f 20.86 rest of 20 welling, 0.77 of dwell 19.86 cole dwe 20.27 I tempe 20.27	follo 2 follo 2 h2, h2, follo 1 raturaturaturaturaturaturaturaturaturatu	Jun 0.64 ow ste 20.97 velling 20.01 m (se 0.55 T2 (fo 19.99 g) = fl 20.4 ure fro 20.4	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste 20 LA × T1 20.42 m Table 20.42	0.57 in T 20. able 9 2	ug 52 able 99 52 Table 90 52 T	Sep 0.77 29c) 20.92 2 (°C) 20 0.69 in Tabl 19.94 f A) × T2 20.35 re appro- 20.35	20.61 20 0.93 e 9c) 19.56 LA = Liv	0.99 20.21 19.99 0.99 18.98 ving area ÷ 19.49 =(76)m ar	19 19 0. 18 (4) =	.89 .99 .51 .08		0.42	(87) (88) (89) (90) (91)
Mean i (86)m= Mean i (87)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= Set Ti t the utili	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99 nternal 18.54 nternal 19.11 adjustn 19.11 ce hea to the r isation Jan	tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75 I tempera 19.29 hent to th 19.29 ting requences	Mar 0.98 ature in 20.31 eating p 19.98 ains for 0.97 ature in 19.11 ature (for 19.61 irement ernal ter r gains Mar	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest 19.56 or the wh 20 n interna 20 mperaturusing Tal	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell 19.86 aole dwe 20.27 I tempe 20.27 re obtainable 9a	follo 2 follo 2 h2, h2, follo 1 raturaturaturaturaturaturaturaturaturatu	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55 T2 (fd 9.99 g) = fl 20.4 ure fro 20.4	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste 20 LA × T1 20.42 m Table 20.42 ep 11 of	0.57 in T 20. able 9 2	ug 52 52 53 54 55 55 55 55 55 55	Sep 0.77 29c) 20.92 2 (°C) 20 0.69 in Tabl 19.94 f A) × T2 20.35 re appro 20.35 , so tha	0.95 20.61 20 0.93 e 9c) 19.56 LA = Livitation 20 opriate 20 t Ti,m:	0.99 20.21 19.99 0.99 18.98 ving area ÷ 19.49 =(76)m ar	19 19 0. 18 18 14 19 19 19 19 19 19	.89 .99 .51		0.42	(87) (88) (89) (90) (91)

Useful gains, hmGm , W	/ – (04)m :	(84)m									
	41.96 459	` '	307.55	207.49	217.05	316.53	364.09	352.67	348.67		(95)
Monthly average externa				207.49	217.03	310.55	304.03	332.07	340.07		(00)
, , , , , , , , , , , , , , , , , , , 	6.5 8.		14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean	internal te	mperature,	Lm , W :	=[(39)m	x [(93)m	– (96)m]				
	37.19 615		317.06	208.74	219.15	343.49	520.32	689.5	832.35		(97)
Space heating requirement	ent for ea	ch month, k	:Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 351.95 273.27 2°	19.65 112	.97 41.25	0	0	0	0	116.24	242.52	359.86		
<u> </u>		•			Tota	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	1717.71	(98)
Space heating requirement	ent in kWł	n/m²/year								34.35	(99)
9a. Energy requirements	– Individu	al heating s	systems i	ncluding	micro-C	CHP)					
Space heating:									_		_
Fraction of space heat fr	om secon	dary/supple	ementary	system						0	(201)
Fraction of space heat fr	om main :	system(s)			(202) = 1	- (201) =				1	(202)
Fraction of total heating	from main	system 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space	heating s	ystem 1								93.5	(206)
Efficiency of secondary/s	suppl <mark>eme</mark>	ntary heatin	g systen	n, %						0	(208)
Jan Feb	Mar A	pr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement	ent (calcu	ated above)								
351.95 273.27 2°	19.65 112	.97 41.25	0	0	0	0	116.24	242.52	359.86		
(211) m = {[(98)m x (204)]	} x 100 ÷	(206)									(211)
	34.92 120		0	0	0	0	124.32	259.38	384.88		
					Tota	l (kWh/yea	ar) =Sum(2	211),5,1012		1837.12	(211)
Space heating fuel (seco	ondary), k'	Wh/month									_
= {[(98)m x (201)] } x 100	÷ (208)										
(215)m = 0 0	0 0	0	0	0	0	0	0	0	0		_
					Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating											_
Output from water heater			T	T	T						
	56.04 140	.51 138.15	124.1	119.81	130.61	130.11	145.67	153.24	164.04		٦
Efficiency of water heater			T	l	l					79.8	(216)
` '	5.73 84.	24 82.03	79.8	79.8	79.8	79.8	84.22	86.03	86.85		(217)
Fuel for water heating, kV $(219)m = (64)m \times 100 \div$											
` '	32.02 166	5.8 168.42	155.51	150.13	163.67	163.04	172.97	178.12	188.87		
	•	•	•	•	Tota	I = Sum(2	19a) ₁₁₂ =	•		2054.47	(219)
Annual totals							k'	Wh/year		kWh/year	_
Space heating fuel used,	main syst	em 1								1837.12	
Water heating fuel used									Ī	2054.47	
Electricity for pumps, fans	and elec	tric keep-ho	ot						•		_
central heating pump:									30		(230c)

boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting				233.78	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	396.82	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	443.76	(264)
Space and water heating	(261) + (262) + (263) + (264) =			840.58	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)

(232) x

TER = 20.02 (273)

0.519

sum of (265)...(271) =

Electricity for lighting

Total CO2, kg/year

(268)

(272)

121.33

1000.84

User Details:	
Assessor Name: Stroma Number: Software Name: Stroma FSAP 2012 Software Version: Version: 1.0).4.26
Property Address: B57_Be Lean The Charlie Patchford Control Palmont Street LONDON NWA SUF	
Address: The Charlie Ratchford Centre, Belmont Street, LONDON, NW1 8HF 1. Overall dwelling dimensions:	
	ume(m³)
	196.28 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	196.28 (5)
2. Ventilation rate:	
main secondary other total m³ heating heating	per hour
Number of chimneys $0 + 0 = 0 \times 40 =$	0 (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	0 (6b)
Number of intermittent fans 0 x 10 =	0 (7a)
Number of passive vents 0 × 10 =	0 (7b)
Number of flueless gas fires 0 × 40 =	0 (7c)
Air change	s per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)	0 (9)
Additional infiltration [(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)
If no draught lobby, enter 0.05, else enter 0	0 (13)
Percentage of windows and doors draught stripped	0 (14)
Window infiltration 0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	3 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.15 (18)
Number of sides sheltered	2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.13 (21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	
Wind Factor (22a)m = (22) m \div 4	

Adjusted infiltr	ation rat	te (allowi	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effe		•	rate for t	пе арри	саріе са	ise						0.5	(23a)
If exhaust air h	eat pump	using App	endix N, (2	23b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced with	h heat rec	overy: effic	eiency in %	allowing t	or in-use f	actor (fron	n Table 4h) =				76.5	(23c)
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27]	(24a)
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	MV) (24b	m = (22)	2b)m + (23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•									
	1	× (23b), 1	· ` `	ŕ	ŕ	· ` `	ŕ	ŕ	· ` `	í –		1	(0.4-)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r		on or wh ien (24d)		•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and h	eat loss	paramet	er:							_	_	
ELEMENT	Gro	SS	Openir		Net Ar		U-val		ΑXU		k-valu		ΑΧk
	area	(m²)	n) ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²•	K	kJ/K
Doors					2.4	X	1.3		3.12				(26)
Windows Type					2.6		/[1/(1.3)+		3.21	닡			(27)
Windows Type					2.4		/[1/(1.3)+		2.97	닡			(27)
Windows Type					2.6	=	/[1/(1.3)+		3.21	_			(27)
Windows Type					2.6		/[1/(1.3)+		3.21	_			(27)
Windows Type	e 5 				2.6	x1	/[1/(1.3)+	0.04] =	3.21	╛.			(27)
Walls Type1	22.9	96	23		-0.04	X	0.15	=	-0.01	<u> </u>		_	(29)
Walls Type2	8.1	2	0		8.12	X	0.14	=	1.15			_	(29)
Walls Type3	12.0	04	0		12.04	1 X	0.13	=	1.59				(29)
Total area of e	elements	s, m²			43.12	2							(31)
* for windows and ** include the are						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	1 3.2	
Fabric heat los				із апа раг	uuons		(26)(30) + (32) =				31.31	(33)
Heat capacity		•	- /					((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass		,	⊃ = Cm -	÷ TFA) ir	n kJ/m²K			., ,	itive Value	, , ,	· -/	250	(35)
For design asses	-						ecisely the	e indicative	e values of	TMP in Ta	able 1f		(/
can be used inste													
Thermal bridg					-	K						2.16	(36)
if details of therma Total fabric he		are not kr	own (36) :	= 0.05 x (3	11)			(33) +	· (36) =			33.47	(37)
Ventilation hea		alculated	d monthl	V					= 0.33 × ((25)m x (5))	33.47	(07)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
			1	 ,	1	1	1	1	1	1		ı	

											1	l	
(38)m= 18.14	17.93	17.73	16.7	16.49	15.46	15.46	15.25	15.87	16.49	16.9	17.31		(38)
Heat transfer of						·	1		= (37) + (ī	ı	
(39)m= 51.61	51.4	51.19	50.16	49.95	48.92	48.92	48.72	49.33	49.95	50.37	50.78		7(00)
Heat loss para	meter (l	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	50.11	(39)
(40)m= 0.74	0.73	0.73	0.72	0.71	0.7	0.7	0.69	0.7	0.71	0.72	0.72		_
Number of day	vs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.71	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
												l	
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
A sourced soon	in on our	N I										1	(40)
Assumed occu if TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (1	ΓFA -13.		.25		(42)
Annual average	•	ater usaç	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		8	7.6		(43)
Reduce the annua	-		• .		-	-	to achieve	a water us	se target o	f		l	
		,	· ` `			<u> </u>			0 1				
Jan Hot water usage i	Feb	Mar	Apr ach month	Vd.m = fa	Jun	Jul Table 1c x	(43)	Sep	Oct	Nov	Dec		
(44)m= 96.36	92.86	89.36	85.85	82.35	78.84	78.84	82.35	85.85	89.36	92.86	96.36		
(44)11= 90.30	92.00	09.30	05.05	02.33	70.04	70.04	02.33			m(44) ₁₁₂ =		1051.24	(44)
Ener <mark>gy cont</mark> ent of	f hot wa <mark>ter</mark>	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			` '		1001.21	(\.,'
(45)m= 142.9	124.98	128.97	112.44	107.89	93.1	86.27	99	100.18	116.75	127.44	138.39		
If instantaneous v	vater heati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (16		Γotal = Su	m(45) ₁₁₂ =	=	1378.34	(45)
						1		` ′	47.54	10.40	00.70		(46)
(46)m= 21.44 Water storage	18.75 loss:	19.35	16.87	16.18	13.97	12.94	14.85	15.03	17.51	19.12	20.76		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)					l	
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		oclarad I	oce fact	or ic kno	wo (k\\/k	2/d2x/):					0		(40)
Temperature f				טווא פו וכ	wii (Kvvi	i/uay).					0		(48) (49)
Energy lost fro				aar			(48) x (49)	١ _			0		, ,
b) If manufact		-	-		or is not		(40) X (40)	_		1	10		(50)
Hot water stor			-							0.	.02		(51)
If community h	-		on 4.3									I	
Volume factor Temperature f			2h							—	.03		(52)
·							(47) (54)	· · · (50) · · · (1	-0)		0.6		(53)
Energy lost fro Enter (50) or		_	, KVVII/ye	ear			(47) x (51)) X (52) X (03) =	-	.03		(54) (55)
Water storage	. , .	,	for each	month			((56)m = (55) × (41)r	m		.00		(00)
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain												ix H	()
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3	0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m		
(modified by factor from Table H5 if there is solar water heating and a cylinder thermo	ostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		
(61)m= 0 0 0 0 0 0 0 0 0	0 0	(61)
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m +	(46)m + (57)m +	(59)m + (61)m
(62)m= 198.18 174.91 184.25 165.94 163.17 146.6 141.55 154.28 153.67 172.03	180.94 193.67	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	tion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater	<u> </u>	1
(64)m= 198.18 174.91 184.25 165.94 163.17 146.6 141.55 154.28 153.67 172.03	180.94 193.67	
Output from water heate		2029.18 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m		
(65)m= 91.74 81.5 87.11 80.18 80.1 73.75 72.91 77.14 76.11 83.04	85.17 90.24) (65)
	<u> </u>	l
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is f	rom community n	eating
5. Internal gains (see Table 5 and 5a):		
Metabolic gains (Table 5), Watts		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec	
(66)m= 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43	112.43 112.43	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(67)m= 17.61 15.64 12.72 9.63 7.2 6.08 6.57 8.54 11.46 14.55	16.98 18.1	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 197.53 199.58 194.41 183.42 169.54 156.49 147.78 145.73 150.89 161.89	175.77 188.81	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	-	
(69)m= 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24	34.24 34.24	(69)
Pumps and fans gains (Table 5a)	•	
(70)m= 0 0 0 0 0 0 0 0 0	0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)		1
(71)m= -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94	-89.94 -89.94	(71)
Water heating gains (Table 5)	1	I
(72)m= 123.3 121.28 117.08 111.36 107.65 102.43 97.99 103.68 105.7 111.61	118.29 121.29	(72)
	ļ ļ	
	367.77 384.93	(73)
(73)m= 395.17 393.23 380.94 361.14 341.12 321.73 309.06 314.67 324.78 344.78 6. Solar gains:	307.77 304.93	(73)
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applica	ble orientation	
	FF FF	Gains
	able 6c	(W)
0.00 A 0.00 A	0.7 =	
North 0.9x 0.77 x 2.6 x 10.63 x 0.53 x	0.7	14.22 (74)

	_		7				,		ı				_
North	0.9x	0.77	X	2.6	X	10.63	X	0.53	X	0.7	=	14.22	(74)
North	0.9x	0.77	X	2.6	X	20.32	X	0.53	X	0.7	=	27.17	(74)
North	0.9x	0.77	X	2.6	X	20.32	X	0.53	X	0.7	=	27.17	(74)
North	0.9x	0.77	X	2.6	X	20.32	X	0.53	X	0.7	=	27.17	(74)
North	0.9x	0.77	X	2.6	X	34.53	X	0.53	X	0.7	=	46.16	(74)
North	0.9x	0.77	X	2.6	x	34.53	X	0.53	x	0.7	=	46.16	(74)
North	0.9x	0.77	X	2.6	X	34.53	X	0.53	x	0.7	=	46.16	(74)
North	0.9x	0.77	X	2.6	X	55.46	X	0.53	X	0.7	=	74.15	(74)
North	0.9x	0.77	X	2.6	X	55.46	X	0.53	X	0.7	=	74.15	(74)
North	0.9x	0.77	X	2.6	x	55.46	X	0.53	X	0.7	=	74.15	(74)
North	0.9x	0.77	x	2.6	x	74.72	x	0.53	x	0.7	=	99.89	(74)
North	0.9x	0.77	X	2.6	x	74.72	x	0.53	x	0.7	=	99.89	(74)
North	0.9x	0.77	x	2.6	x	74.72	x	0.53	x	0.7	=	99.89	(74)
North	0.9x	0.77	x	2.6	x	79.99	x	0.53	x	0.7	=	106.94	(74)
North	0.9x	0.77	x	2.6	x	79.99	x	0.53	x	0.7	=	106.94	(74)
North	0.9x	0.77	x	2.6	x	79.99	x	0.53	x	0.7	=	106.94	(74)
North	0.9x	0.77	x	2.6	x	74.68	x	0.53	x	0.7	=	99.84	(74)
North	0.9x	0.77	X	2.6	X	74.68	Х	0.53	X	0.7	=	99.84	(74)
North	0.9x	0.77] x	2.6	x	74.68] x	0.53	x	0.7	=	99.84	(74)
North	0.9x	0.77	x	2.6	х	59.25] x	0.53	x	0.7	=	79.21	(74)
North	0.9x	0.77	x	2.6	x	59.25	x	0.53	x	0.7	=	79.21	(74)
North	0.9x	0.77	x	2.6	x	59.25	Х	0.53	x	0.7	=	79.21	(74)
North	0.9x	0.77	x	2.6	x	41.52	x	0.53	x	0.7	=	55.5	(74)
North	0.9x	0.77	x	2.6	х	41.52	x	0.53	x	0.7	=	55.5	(74)
North	0.9x	0.77	x	2.6	x	41.52	x	0.53	x	0.7	=	55.5	(74)
North	0.9x	0.77	X	2.6	x	24.19	X	0.53	x	0.7	=	32.34	(74)
North	0.9x	0.77	x	2.6	x	24.19	x	0.53	x	0.7	=	32.34	(74)
North	0.9x	0.77	x	2.6	x	24.19	x	0.53	x	0.7	=	32.34	(74)
North	0.9x	0.77	x	2.6	x	13.12	x	0.53	x	0.7	=	17.54	(74)
North	0.9x	0.77	x	2.6	x	13.12	x	0.53	x	0.7	=	17.54	(74)
North	0.9x	0.77	x	2.6	x	13.12	x	0.53	x	0.7	=	17.54	(74)
North	0.9x	0.77	x	2.6	x	8.86	X	0.53	X	0.7	=	11.85	(74)
North	0.9x	0.77	x	2.6	x	8.86	х	0.53	X	0.7	=	11.85	(74)
North	0.9x	0.77	x	2.6	x	8.86	x	0.53	x	0.7	=	11.85	(74)
Northeas	st _{0.9x}	0.3	x	2.4	x	11.28	x	0.53	x	0.7	=	2.71	(75)
Northeas	st _{0.9x}	0.3	x	2.6	×	11.28	x	0.53	x	0.7	j =	2.94	(75)
Northeas	st _{0.9x}	0.3	×	2.4	x	22.97	x	0.53	x	0.7	j =	5.52	(75)
Northeas	st _{0.9x}	0.3	×	2.6	×	22.97	x	0.53	x	0.7	=	5.98	(75)
Northeas	st _{0.9x}	0.3	×	2.4	x	41.38	x	0.53	x	0.7	j =	9.95	(75)
Northeas	st _{0.9x}	0.3	×	2.6	x	41.38	x	0.53	x	0.7	=	10.78	(75)
Northeas	st _{0.9x}	0.3	×	2.4	x	67.96	x	0.53	x	0.7	j =	16.34	(75)
	_		-		•		•		1		•		_

Northeast 0.9x 0.3 x 2.6 x 67.96 x 0.53 x 0.7 = 17. Northeast 0.9x 0.3 x 2.4 x 91.35 x 0.53 x 0.7 = 21.9 Northeast 0.9x 0.3 x 2.6 x 91.35 x 0.53 x 0.7 = 23.7	
Northeast 0.9x	7 (75)
Niewtheast as	(75)
Northcoot a c	79 (75)
Northeast 0.9x 0.3 x 2.4 x 97.38 x 0.53 x 0.7 = 23.4	(75)
Northeast 0.9x 0.3 x 2.6 x 97.38 x 0.53 x 0.7 = 25.3	(75)
Northeast 0.9x 0.3 x 2.4 x 91.1 x 0.53 x 0.7 = 21.	9 (75)
Northeast 0.9x 0.3 x 2.6 x 91.1 x 0.53 x 0.7 = 23.7	73 (75)
Northeast 0.9x 0.3 x 2.4 x 72.63 x 0.53 x 0.7 = 17.4	16 (75)
Northeast 0.9x 0.3 x 2.6 x 72.63 x 0.53 x 0.7 = 18.9	(75)
Northeast 0.9x 0.3 x 2.4 x 50.42 x 0.53 x 0.7 = 12.1	(75)
Northeast 0.9x 0.3 x 2.6 x 50.42 x 0.53 x 0.7 = 13.7	(75)
Northeast 0.9x 0.3 x 2.4 x 28.07 x 0.53 x 0.7 = 6.7	5 (75)
Northeast 0.9x 0.3 x 2.6 x 28.07 x 0.53 x 0.7 = 7.3	1 (75)
Northeast 0.9x 0.3 x 2.4 x 14.2 x 0.53 x 0.7 = 3.4	1 (75)
Northeast 0.9x 0.3 x 2.6 x 14.2 x 0.53 x 0.7 = 3.7	(75)
Northeast 0.9x 0.3 x 2.4 x 9.21 x 0.53 x 0.7 = 2.2	2 (75)
Northeast 0.9x 0.3 x 2.6 x 9.21 x 0.53 x 0.7 = 2.4	(75)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
(83)m= 48.3 93.01 159.22 256.49 345.42 369.58 345.14 274 191.77 111.08 59.72 40.17	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 443.47 486.23 540.16 617.63 686.54 691.31 654.21 588.67 516.55 455.85 427.49 425.1	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)	``
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(86)m= 1 0.99 0.97 0.87 0.66 0.45 0.33 0.38 0.65 0.93 0.99 1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 20.39 20.5 20.68 20.9 20.99 21 21 21 20.99 20.86 20.6 20.38	(87)
(67)	(- /
	(88)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	(00)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.31 20.31 20.31 20.33 20.33 20.34 20.34 20.35 20.34 20.33 20.32 20.32	
(88)m= 20.31 20.31 20.31 20.33 20.33 20.34 20.34 20.35 20.34 20.33 20.32 20.32 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(88)m= 20.31 20.31 20.31 20.33 20.33 20.34 20.34 20.35 20.34 20.33 20.32 20.32	(89)
(88)m= 20.31 20.31 20.31 20.33 20.33 20.34 20.34 20.35 20.34 20.33 20.32 20.32 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	(89)
(88)m= 20.31 20.31 20.31 20.33 20.33 20.34 20.34 20.35 20.34 20.33 20.32 20.32 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.96 0.85 0.62 0.41 0.28 0.33 0.59 0.91 0.99 1	(89)
(88)m= 20.31 20.31 20.31 20.33 20.33 20.34 20.34 20.35 20.34 20.33 20.32 20.32 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.96 0.85 0.62 0.41 0.28 0.33 0.59 0.91 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	(90)
(88)m= 20.31 20.31 20.31 20.33 20.33 20.34 20.34 20.35 20.34 20.33 20.32 20.32 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.96 0.85 0.62 0.41 0.28 0.33 0.59 0.91 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.49 19.65 19.92 20.22 20.32 20.34 20.34 20.35 20.33 20.18 19.8 19.48 fLA = Living area ÷ (4) = 0.4	(90)
(88)m= 20.31 20.31 20.31 20.33 20.33 20.34 20.34 20.35 20.34 20.33 20.32 20.32 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.96 0.85 0.62 0.41 0.28 0.33 0.59 0.91 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.49 19.65 19.92 20.22 20.32 20.34 20.34 20.35 20.33 20.18 19.8 19.48	(90)
	(90) 5 (91)
	(90) 5 (91)
	(90) 5 (91) (92)

Aug_

Sep

Oct

Nov

Dec

Jul

Jun

Apr

May

Mar

the utilisation factor for gains using Table 9a

Feb

Jan

Utilisation factor for gains, hm:												
(94)m= 0.99 0.99 0.96 0.86 0.64 0.43 0.3 0.35	0.62	0.91	0.99	1 1		(94)						
Useful gains, hmGm , W = (94)m x (84)m	0.02	0.01	0.00			` ,						
(95)m= 440.87 480.24 520.03 528.16 439.29 295.11 197.53 206.48	318.66	416.83	421.27	423.17		(95)						
Monthly average external temperature from Table 8												
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4	14.1	10.6	7.1	4.2		(96)						
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m		r e	1									
(97)m= 804.86 777.77 704.52 583.19 445.57 295.37 197.55 206.52	322.1	493.77	657.82	796.35		(97)						
Space heating requirement for each month, kWh/month = $0.024 \times [(9700)]$ x (98)m= 270.81 199.94 137.26 39.63 4.67 0 0 0	')m – (95 0	5)m] x (4 57.24	1)m 170.31	277.64								
	al per year	<u> </u>			1157.5	(98)						
	ai pei yeai	(KVVII/yeai) = Sum(s	/O)15,912 =								
Space heating requirement in kWh/m²/year					16.51	(99)						
9b. Energy requirements – Community heating scheme												
This part is used for space heating, space cooling or water heating proversation of space heat from secondary/supplementary heating (Table 1	•		unity sch	neme.	0	(301)						
Fraction of space heat from community system 1 – (301) =	., •				1	」` /](302)						
The community scheme may obtain heat from several sources. The procedure allows for	CHP and	un to four	other heat	sources: ti								
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appe		ир ю юиг	Julei Heat	sources, u	ie ialiei							
Fraction of heat from Community boilers												
Fraction of total space heat from Community boilers		(3	02) x (303	a) =	1	(304a)						
Factor for control and charging method (Table 4c(3)) for community he	ating sys	tem			1	(305)						
Distribution loss factor (Table 12c) for community heating system					1.05	(306)						
Space heating					kWh/year	_						
Annual space heating requirement					1157.5]						
Space heat from Community boilers	(98) x (30	04a) x (30	5) x (306)	=	1215.38	(307a)						
Efficiency of secondary/supplementary heating system in % (from Table	e 4a or A	ppendix	E)		0	(308						
Space heating requirement from secondary/supplementary system	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)						
Water heating												
Annual water heating requirement					2029.18							
If DHW from community scheme:	(0.4) (0.	00-) (00	T) (200)		242224							
Water heat from Community boilers		03a) x (30			2130.64	(310a)						
•	I × [(307a)	(307e) +	· (310a)((310e)] =	33.46	(313)						
Cooling System Energy Efficiency Ratio					0	(314)						
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷	- (314) =			0	(315)						
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside					182.59	(330a)						
warm air heating system fans					0	(330b)						
pump for solar water heating					0	(330g)						
Total electricity for the above, kWh/year	=(330a) ·	+ (330b) +	(330g) =		182.59	(331)						

Energy for lighting (calculated in Appendix L) (332)311 12b. CO2 Emissions – Community heating scheme Energy **Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) 90 (367a) CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$ 803.04 (367)0.22 Electrical energy for heat distribution (372)[(313) x]0.52 17.37 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)820.41 CO2 associated with space heating (secondary) (309) x(374)0 0 CO2 associated with water from immersion heater or instantaneous heater (312) x (375)0.22 Total CO2 associated with space and water heating (373) + (374) + (375) =820.41 (376)CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 94.76 CO2 associated with electricity for lighting (332))) x (379)0.52 161.41 sum of (376)...(382) =Total CO2, kg/year (383)1076.58 $(383) \div (4) =$ **Dwelling CO2 Emission Rate** 15.36 (384)El rating (section 14) (385)87.47

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Versio	on: 1.0.4.26	
			Address:						
Address :	The Charlie Ratchford Cent	re, Belm	ont Stree	et, LONI	DON, NV	V1 8HF			
1. Overall dwelling dime	nsions:	Aro	n/m²\		Av. Ho	iaht/m\		Volume(m³	
Ground floor			a(m²) 70.1	(1a) x		ight(m) 2.8	(2a) =	196.28	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	,		(4)				100.20	
Dwelling volume	2) ((2) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) ((3) (((3) ((3) ((3) ((3) ((3) ((3) (((3) ((3) ((3) (((3) ((3) (((3) (((3) (((3) (((3) ((((70.1)+(3c)+(3d	l)+(3e)+	(3n) =	196.28	(5)
-				(33)	, (23) (23	, (2-2)		190.26	(0)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	7
Number of chimneys	heating heating beauting heating	□ + ⊏	0	1 = [0	x	40 =	0	(6a)
Number of open flues	0 + 0	╣ + ├	0]	0	x :	20 =	0	(6b)
Number of intermittent far				J L	3	x	10 =	30	(7a)
Number of passive vents				L	0		10 =	0](7b)
Number of flueless gas fi	res			L	0	X 4	40 =	0	(7c)
Transcr of fideless gas in				L	0			0	(70)
							Air ch	nanges <mark>per</mark> ho	ur
Infilt <mark>ration</mark> due to chimney	/s, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	Г	30		÷ (5) =	0.15	(8)
	een carried out or is intended, proceed	ed to (17), o	otherwise o	ontinue fr	om (9) to ((16)			-
Number of storeys in the Additional infiltration	ne dw <mark>elling</mark> (ns)					[(0)	41.0.4	0	(9)
	25 for steel or timber frame o	r 0 35 for	r maconr	v constr	ruction	[(9)	-1]x0.1 =	0	(10)
	esent, use the value corresponding t			•	uction			0	(11)
deducting areas of opening	gs); if equal user 0.35								_
·	loor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent								0	(13)
Window infiltration	and doors draught stripped		0.25 - [0.2	v (14) ± 1	001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	•	+ (15) =		0	(15)
	q50, expressed in cubic metre	es ner ho	. , . ,		, , ,	, ,	area	0	(16)
•	ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	Clic of C	пусторс	arca	0.4	(18)
·	s if a pressurisation test has been do				is being u	sed		0.4	(,
Number of sides sheltere	d							2	(19)
Shelter factor			(20) = 1 - [0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.34	(21)
Infiltration rate modified for	or monthly wind speed				1	1		1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7							,	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
					<u> </u>	<u>. </u>		ı	

Adjusted infiltr	ation rate	e (allowi	ing for sl	nelter an	d wind s	speed) =	(21a) 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	0.4		
Calculate effe			rate for t	пе арріі	саріе са	se						0	(23
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with									, , ,			0	(23
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2:	2b)m + (23b) × [1 – (23c)		
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	лV) (24b	m = (22)	2b)m + (23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	ouse ext			•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)r	ventilation			•	•				0.5]	!		•	
24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)			•	•	
25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25
3. Heat losse	s and he	eat loss r	naramet	er.					_			_	
ELEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	e	ΑΧk
	area	(m²)	'n	12	A ,r	n²	W/m2	2K	(W/I	K)	kJ/m²-	K	kJ/K
Doo <mark>rs</mark>					2.4	Х	1.2		2.88				(26
Vin <mark>dows</mark> Type	1				1.91	x1.	/[1/(1.4)+	0.04] =	2.53	Ц			(27
Vindows Type					1.76	x1.	/[1/(1.4)+	0.04] =	2.33	Ц			(27
Vindows Type	e 3				1.91	x1.	/[1/(1.4)+	0.04] =	2.53				(2
Vindows Type	e 4				1.91	х1.	/[1/(1.4)+	0.04] =	2.53				(2
Vindows Type	e 5				1.91	х1.	/[1/(1.4)+	0.04] =	2.53				(2
Valls Type1	22.9	6	17.5	3	5.43	X	0.18	=	0.98	\Box [(2
Valls Type2	8.12	2	0		8.12	Х	0.18	=	1.46				(2
Valls Type3	12.0	4	0		12.04	x	0.18	=	2.17				(2
otal area of e	elements	, m²			43.12	2							(3
for windows and						ated using	formula 1	!/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
* include the area				is and par	titions		(26)(30) + (32) -					
abric heat los leat capacity		•	U)				(20)(00)	, , ,	(30) + (32	2) + (225)	(320) -	27.54	
hermal mass	,	•	2 – Cm -	_ ΤΕΔ\ ir	n k I/m²K			., ,	tive Value	, , ,	(326) =	0	(3
or design assess	•	•		,			ecisely the				able 1f	250	(3
an be used inste					2.3 110	pi							
hermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						2.16	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	11)			(a=)	(0.0)				
otal fabric he									(36) =	/ > :		29.7	(3
entilation hea			· ·						= 0.33 × (1	<u> </u>	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m= 38.56 38.32 38.08 36.98 36.77 35.81 35.81 35.64 36.18 36.77 37.19 37	7.63 (38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m	
	7.33
Average = Sum(39) ₁₁₂ /1 Heat loss parameter (HLP), W/m ² K $ (40)m = (39)m \div (4) $	12= 66.68 (39)
(40)m= 0.97 0.97 0.97 0.95 0.95 0.93 0.93 0.93 0.94 0.95 0.95 0	0.96
Average = Sum(40) ₁₁₂ /1 Number of days in month (Table 1a)	12= 0.95 (40)
	Dec
(41)m= 31 28 31 30 31 30 31 30 31 30	31 (41)
4. Water heating energy requirement: kN	Wh/year:
Assumed occupancy, N 2 25	(42)
Assumed occupancy, N $= 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov I Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	Dec
	6.36
Total = Sum(44) ₁₋₁₂ =	1051.24 (44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)	` '
(45)m= 142.9 124.98 128.97 112.44 107.89 93.1 86.27 99 100.18 116.75 127.44 13	38.39
Total = Sum(45) ₁₁₂ = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	1378.34 (45)
	0.76 (46)
Water storage loss:	5.76
Storage volume (litres) including any solar or WWHRS storage within same vessel 150	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year $(48) \times (49) = 0.75$	(50)
b) If manufacturer's declared cylinder loss factor is not known:	
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)
If community heating see section 4.3 Volume factor from Table 2a	(50)
Temperature factor from Table 2b	(52)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(54)
Enter (50) or (54) in (55)	(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	3.33 (56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from A	ppendix H
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	3.33 (57)

Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$	
(61)m= 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)n$	1
(62)m= 189.5 167.07 175.57 157.53 154.49 138.19 132.87 145.59 145.27 163.35 172.53 184.99	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 189.5 167.07 175.57 157.53 154.49 138.19 132.87 145.59 145.27 163.35 172.53 184.99	
Output from water heater (annual) ₁₁₂ 1926.95	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 84.79 75.23 80.16 73.46 73.15 67.03 65.96 70.19 69.38 76.1 78.45 83.29	(65)
include (57)m in-calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 17.62 15.65 12.73 9.64 7.2 6.08 6.57 8.54 11.46 14.55 16.99 18.11	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 197.53 199.58 194.41 183.42 169.54 156.49 147.78 145.73 150.89 161.89 175.77 188.81	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24	(69)
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94	(71)
Water heating gains (Table 5)	
(72)m= 113.97 111.94 107.74 102.03 98.32 93.1 88.66 94.35 96.37 102.28 108.96 111.95	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 388.85 386.9 374.61 354.81 334.79 315.4 302.73 308.34 318.45 338.45 361.44 378.6	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6d m² Table 6a Table 6b Table 6c (W)	
North 0.9x 0.77 x 1.91 x 10.63 x 0.63 x 0.7 = 12.41	(74)
North 0.9x 0.77 x 1.91 x 10.63 x 0.63 x 0.7 = 12.41	(74)

North		_		_		_						_		_
North	North	0.9x	0.77	X	1.91	X	10.63	X	0.63	X	0.7	=	12.41	(74)
North	North	0.9x	0.77	X	1.91	x	20.32	X	0.63	X	0.7	=	23.72	(74)
North	North	0.9x	0.77	X	1.91	X	20.32	x	0.63	X	0.7	=	23.72	(74)
North	North	0.9x	0.77	X	1.91	x	20.32	x	0.63	X	0.7	=	23.72	(74)
North	North	0.9x	0.77	X	1.91	x	34.53	X	0.63	X	0.7	=	40.31	(74)
North	North	0.9x	0.77	X	1.91	X	34.53	X	0.63	X	0.7	=	40.31	(74)
North	North	0.9x	0.77	X	1.91	x	34.53	X	0.63	X	0.7	=	40.31	(74)
North	North	0.9x	0.77	X	1.91	x	55.46	x	0.63	X	0.7	=	64.75	(74)
North	North	0.9x	0.77	X	1.91	x	55.46	X	0.63	X	0.7	=	64.75	(74)
North	North	0.9x	0.77	X	1.91	x	55.46	X	0.63	X	0.7	=	64.75	(74)
North	North	0.9x	0.77	X	1.91	x	74.72	X	0.63	X	0.7	=	87.23	(74)
North	North	0.9x	0.77	X	1.91	X	74.72	X	0.63	X	0.7	=	87.23	(74)
North	North	0.9x	0.77	X	1.91	x	74.72	x	0.63	X	0.7	=	87.23	(74)
North	North	0.9x	0.77	X	1.91	x	79.99	X	0.63	X	0.7	=	93.38	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	79.99	X	0.63	X	0.7	=	93.38	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	79.99	x	0.63	X	0.7	=	93.38	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	X	74.68	X	0.63	X	0.7	=	87.18	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	X	74.68	Х	0.63	X	0.7	=	87.18	(74)
North 0.9x 0.77 x 1.91 x 59.26 x 0.63 x 0.7 = 69.17 (74) North 0.9x 0.77 x 1.91 x 41.52 x 0.63 x 0.7 = 48.47 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) Northeast 0.9x 0.3 x 1.76 x 11.28 x 0.63 x 0.7 = 2.57 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75)	North	0.9x	0.77	x	1.91	х	74.68	x	0.63	x	0.7	=	87.18	(74)
North	North	0.9x	0.77	x	1.91	х	59.25	x	0.63	x	0.7	=	69.17	(74)
North	North	0.9x	0.77	X	1.91	X	59.25	X	0.63	x	0.7	=	69.17	(74)
North	North	0.9x	0.77	x	1.91	x	59.2 <mark>5</mark>	Х	0.63	x	0.7	=	69.17	(74)
North	North	0.9x	0.77	x	1.91	x	41.52	X	0.63	x	0.7	=	48.47	(74)
North	North	0.9x	0.77	X	1.91	х	41.52	x	0.63	x	0.7	=	48.47	(74)
North	North	0.9x	0.77	X	1.91	x	41.52	x	0.63	X	0.7	=	48.47	(74)
North	North	0.9x	0.77	X	1.91	X	24.19	X	0.63	X	0.7	=	28.24	(74)
North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) Northeast 0.9x 0.3 x 1.76 x 11.28 x 0.63 x 0.7 = 2.36 (75) Northeast 0.9x 0.3 x 1.76 x 11.28 x 0.63 x 0.7 = 2.57 (75) Northeast 0.9x 0.3 x 1.76 x 22.97 x 0.63 x 0.7 = 2.57 (75) Northeast 0.9x 0.3 x 1.91 x 22.97 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 8.67 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 9.41 (75)	North	0.9x	0.77	X	1.91	x	24.19	X	0.63	X	0.7	=	28.24	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	24.19	x	0.63	X	0.7	=	28.24	(74)
North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) Northeast 0.9x 0.3 x 1.76 x 11.28 x 0.63 x 0.7 = 2.36 (75) Northeast 0.9x 0.3 x 1.76 x 22.97 x 0.63 x 0.7 = 2.57 (75) Northeast 0.9x 0.3 x 1.76 x 22.97 <td>North</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.91</td> <td>x</td> <td>13.12</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>15.31</td> <td>(74)</td>	North	0.9x	0.77	X	1.91	x	13.12	X	0.63	X	0.7	=	15.31	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	13.12	X	0.63	X	0.7	=	15.31	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	13.12	x	0.63	X	0.7	=	15.31	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	8.86	x	0.63	X	0.7	=	10.35	(74)
Northeast 0.9x	North	0.9x	0.77	X	1.91	x	8.86	x	0.63	X	0.7	=	10.35	(74)
Northeast 0.9x	North	0.9x	0.77	x	1.91	x	8.86	x	0.63	X	0.7	=	10.35	(74)
Northeast 0.9x	Northeas	st _{0.9x}	0.3	X	1.76	x	11.28	x	0.63	X	0.7	=	2.36	(75)
Northeast 0.9x	Northeas	st _{0.9x}	0.3	X	1.91	x	11.28	x	0.63	X	0.7	=	2.57	(75)
Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 8.67 (75) Northeast 0.9x 0.3 x 1.91 x 41.38 x 0.63 x 0.7 = 9.41 (75)	Northeas	st _{0.9x}	0.3	x	1.76	x	22.97	x	0.63	x	0.7	=	4.81	(75)
Northeast 0.9x 0.3 x 1.91 x 41.38 x 0.63 x 0.7 = 9.41 (75)	Northeas	st _{0.9x}	0.3	X	1.91	x	22.97	x	0.63	x	0.7	=	5.22	(75)
	Northeas	st _{0.9x}	0.3	X	1.76	x	41.38	x	0.63	x	0.7	=	8.67	(75)
Northeast 0.9x 0.3 x 1.76 x 67.96 x 0.63 x 0.7 = 14.24 (75)	Northeas	st _{0.9x}	0.3	x	1.91	x	41.38	x	0.63	X	0.7	=	9.41	(75)
	Northeas	st 0.9x	0.3	x	1.76	x	67.96	x	0.63	X	0.7	=	14.24	(75)

Northeast _{0.9x}	0.3	X	1.91	1	x [67.96	X	0.63	X	0.7	=	15.45	(75)
Northeast _{0.9x}	0.3	x	1.76	3	x [91.35	x	0.63	x	0.7	=	19.14	(75)
Northeast _{0.9x}	0.3	x	1.91	1	x [91.35	X	0.63	x	0.7	=	20.77	(75)
Northeast _{0.9x}	0.3	X	1.76	3	x [97.38	X	0.63	x	0.7	=	20.41	(75)
Northeast _{0.9x}	0.3	×	1.91	1	x [97.38	X	0.63	×	0.7	=	22.15	(75)
Northeast _{0.9x}	0.3	x	1.76	6	x [91.1	X	0.63	x	0.7	=	19.09	(75)
Northeast 0.9x	0.3	×	1.91	1	x [91.1	X	0.63	x	0.7	=	20.72	(75)
Northeast _{0.9x}	0.3	×	1.76	6	x [72.63	X	0.63	×	0.7	=	15.22	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x [72.63	X	0.63	X	0.7	=	16.52	(75)
Northeast 0.9x	0.3	X	1.76	6	x [50.42	x	0.63	X	0.7	=	10.57	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x [50.42	x	0.63	X	0.7	=	11.47	(75)
Northeast _{0.9x}	0.3	X	1.76	6	x [28.07	x	0.63	X	0.7	=	5.88	(75)
Northeast _{0.9x}	0.3	x	1.91	1	x [28.07	x	0.63	X	0.7	=	6.38	(75)
Northeast _{0.9x}	0.3	X	1.76	6	x [14.2	x	0.63	X	0.7	=	2.98	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x [14.2	x	0.63	X	0.7	=	3.23	(75)
Northeast _{0.9x}	0.3	X	1.76	ô	x [9.21	x	0.63	X	0.7	=	1.93	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x	9.21	x	0.63	X	0.7	=	2.1	(75)
Solar gains in							<u>` </u>	= Sum(74)m .	(82)m	_		,	
(83)m= 42.17		39.02	223.95	301.6		2.69 301.35	239	.24 167.44	96.98	52.15	35.07		(83)
Total gains – i		_	<u>` </u>	` '		/ 	V		45-4			1	(0.4)
(84)m= 431.02	468.11 51	3.63	578.76	636.38	638	8.09 604.08	547	.58 485.89	435.43	3 413.59	413.68		(84)
						-						J	
7. Mean inter	rnal tempera	ature (heating	season)									
7. Mean inter						rea from Tab	ole 9,					21	(85)
	during hea	ting pe	eriods in	the livir	ng a		ole 9,					21	(85)
Temperature	during hea	ting pe	eriods in	the livir	ng a (se		ı		Oct	Nov	Dec	21	(85)
Temperature Utilisation fac	during heat ctor for gain	ting pe	eriods in ving area	the livir	ng a (se J	e Table 9a)	ı	Th1 (°C)		Nov 1		21	(85)
Temperature Utilisation fac	during hea ctor for gain: Feb	ting pe s for li Mar	ving area Apr 0.96	the livir a, h1,m May	ng a (se J	e Table 9a) un Jul 64 0.47	0.5	Th1 (°C) ug Sep 4 0.83	Oct	-	Dec	21	
Temperature Utilisation fac Jan (86)m= 1	during hea	ting pe s for li Mar	ving area Apr 0.96	the livir a, h1,m May	ng a (se J o.	e Table 9a) un Jul 64 0.47	0.5	Th1 (°C) ug Sep 4 0.83 Table 9c)	Oct	1	Dec	21	
Temperature Utilisation fac Jan (86)m= 1 Mean interna	tor for gains Feb 1 0 1 temperatu 20.13 2	s for li Mar 0.99	ving area Apr 0.96 iving are 20.65	the living a, h1,m May 0.84 a T1 (for 20.89	(se J 0. ollow	e Table 9a) un Jul 64 0.47 v steps 3 to 7	0.57 in T	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93	Oct 0.97	1	Dec 1	21	(86)
Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 20.02	during hear ctor for gains Feb 1 0 1 temperatu 20.13 2 during hear	s for li Mar 0.99	ving area Apr 0.96 iving are 20.65	the living a, h1,m May 0.84 a T1 (for 20.89	(se J 0. 20	e Table 9a) un Jul 64 0.47 v steps 3 to 7	0.57 in T	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93 9, Th2 (°C)	Oct 0.97	1 20.28	Dec 1	21	(86)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11	during hear ctor for gains Feb 1 0 1 temperatu 20.13 2 during hear 20.11 2	s for ling persons for	ving area Apr 0.96 iving are 20.65 eriods in 20.12	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13	(se J 0. billow 20	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14	Ai 0.57 in T 20.42 able 9 20.	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93 9, Th2 (°C)	Oct 0.97	20.28	Dec 1 20	21	(86)
Temperature Utilisation factors Jan (86)m= 1 Mean internations (87)m= 20.02 Temperature	during hear ctor for gain. Feb 1	s for ling persons for	ving area Apr 0.96 iving are 20.65 eriods in 20.12	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13	ng a (se J o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14	Ai 0.57 in T 20.42 able 9 20.	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93 9, Th2 (°C) 14 20.13	Oct 0.97	20.28	Dec 1 20		(86)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation factors (89)m= 1	during hear ctor for gains Feb 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re	ving area Apr 0.96 iving are 20.65 eriods in 20.12 est of dw	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8	ong a (see	e Table 9a) un Jul 64 0.47 v steps 3 to 7 0.98 21 elling from Ta 0.14 20.14 n (see Table 56 0.38	Au 0.5 7 in T 20.3 able 9 20. 9a) 0.4	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 0, Th2 (°C) 14 20.13	Oct 0.97 20.63 20.13	20.28	Dec 1 20 20.12	21	(86) (87) (88)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fact (89)m= 1 Mean internation	during hear tor for gains feb 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	s for li Mar 0.99 re in li 0.34 ting per 0.11 s for re 0.98 re in t	ving are Apr 0.96 iving are 20.65 eriods in 20.12 est of dw 0.94 he rest of	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8 of dwelling the control of the control	(se J 0. o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 1.98 21 elling from Ta 1.14 20.14 n (see Table 56 0.38	Ai 0.57 in T 20.94 20. 9a) 0.4	Th1 (°C) ug Sep 4 0.83 fable 9c) 99 20.93 0, Th2 (°C) 14 20.13 4 0.76 to 7 in Tabl	Oct 0.97 20.63 20.13 0.96 e 9c)	20.28	Dec 1 20 20.12		(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation factors (89)m= 1	during hear tor for gains feb 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re	ving area Apr 0.96 iving are 20.65 eriods in 20.12 est of dw	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8	(se J 0. o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 0.98 21 elling from Ta 0.14 20.14 n (see Table 56 0.38	Au 0.5 7 in T 20.3 able 9 20. 9a) 0.4	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 0, Th2 (°C) 14 20.13 4 0.76 to 7 in Table 14 20.07	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69	20.28	Dec 1 20 20.12 1 18.78		(86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fact (89)m= 1 Mean internation (90)m= 18.79	during hear ctor for gains Feb 1 0 1 temperatu 20.13 2 during hear 20.11 2 ctor for gains 0.99 0 1 temperatu 18.95 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re 0.98 re in t	Apr 0.96 iving are 20.65 eriods in 20.12 est of dw 0.94 he rest of	the living a, h1,m May 0.84 a T1 (for 20.89 arest of 20.13 avelling, h 0.8 are discounted by the control of the	(se J 0. o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 98 21 elling from Ta 1.14 20.14 n (see Table 56 0.38 T2 (follow ste	Al 0.5 7 in T 20. 4 able 9 20. 9a) 0.4 20.2	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93 9, Th2 (°C) 14 20.13 4 0.76 to 7 in Table 14 20.07	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69	20.28 20.12 0.99	Dec 1 20 20.12 1 18.78	0.45	(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation factors (89)m= 1 Mean internation (90)m= 18.79 Mean internation	during hear ctor for gain. Feb 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re 0.98 re in t 9.26	ving area Apr 0.96 viving are 20.65 eriods in 20.12 est of dw 0.94 he rest of 19.71 rest of the wholes the control of the control o	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8 of dwelling old ble dwelling ble ble dwelling ble ble dwelling ble ble dwelling ble	ung a (see J o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14 n (see Table 56 0.38 T2 (follow ste .13 20.14) = fLA × T1	Al 0.5.7 in T 20	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93 9, Th2 (°C) 14 20.13 4 0.76 to 7 in Table 14 20.07 f fLA) x T2	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69 LA = Liv	1 20.28 20.12 0.99 19.19 ving area ÷ (4	Dec 1 20 20.12 1 18.78 4) =		(86) (87) (88) (89) (90) (91)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fact (89)m= 1 Mean internation (90)m= 18.79 Mean internation (92)m= 19.34	during hear ctor for gains feb 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re 0.98 re in t 9.26	Apr 0.96 viving are 20.65 eriods in 20.12 est of dw 0.94 he rest of 19.71 r the who 20.13	the living a, h1,m May 0.84 a T1 (for 20.89 arest of 20.13 avelling, h 0.8 arest of dwelling 20.02 are the dwelling 20.41 are the dw	ung a (see J 0. o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 0.98 21 elling from Ta 0.14 20.14 n (see Table 56 0.38 F2 (follow steps 1.13 20.14) = fLA × T1 0.51 20.52	And 0.5.77 in T 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93 9, Th2 (°C) 14 20.13 4 0.76 to 7 in Table 14 20.07 f	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69 LA = Liv	1 20.28 20.12 0.99 19.19 ving area ÷ (4	Dec 1 20 20.12 1 18.78		(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation factors (89)m= 1 Mean internation (90)m= 18.79 Mean internation (92)m= 19.34 Apply adjusti	during hear ctor for gain. Feb 1 1 20.13 2 during hear 20.11 20.11 2 ctor for gain. 0.99 0 1 temperature 18.95 1 temperature 19.48 1 ment to the	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re 0.98 re in t 9.26 re (for 9.75 mean	Apr 0.96 iving are 20.65 eriods in 20.12 est of dw 0.94 he rest of 19.71 rest of 19.71 internal	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8 of dwelling 20.02 ble dwel 20.41 temperation of the living and the l	self and a	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14 n (see Table 56 0.38 T2 (follow ste .13 20.14) = fLA × T1 .51 20.52 e from Table	All 0.57 in T 20.0 20.0 9a) 0.4 eps 3 20.0 + (1 20.0 4e, 14e, 14e, 14e, 14e, 14e, 14e, 14e,	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 9, Th2 (°C) 14 20.13 4 0.76 to 7 in Table 14 20.07 f — fLA) x T2 52 20.46 where approximates a second content of the cont	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69 LA = Liv	1 20.28 20.12 0.99 19.19 ving area ÷ (4	Dec 1 20 20.12 1 18.78 4) =		(86) (87) (88) (89) (90) (91)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fact (89)m= 1 Mean internation (90)m= 18.79 Mean internation (92)m= 19.34 Apply adjustic (93)m= 19.34	during hear ctor for gains Feb 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re 0.98 re in t 9.26 re (for 9.75 mean 9.75	Apr 0.96 viving are 20.65 eriods in 20.12 est of dw 0.94 he rest of 19.71 r the who 20.13	the living a, h1,m May 0.84 a T1 (for 20.89 arest of 20.13 avelling, h 0.8 arest of dwelling 20.02 are the dwelling 20.41 are the dw	self and a	e Table 9a) un Jul 64 0.47 v steps 3 to 7 0.98 21 elling from Ta 0.14 20.14 n (see Table 56 0.38 F2 (follow steps 1.13 20.14) = fLA × T1 0.51 20.52	And 0.5.77 in T 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 9, Th2 (°C) 14 20.13 4 0.76 to 7 in Table 14 20.07 f — fLA) x T2 52 20.46 where approximates a second content of the cont	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69 LA = Liv	1 20.28 20.12 0.99 19.19 ving area ÷ (4	Dec 1 20 20.12 1 18.78 4) =		(86) (87) (88) (89) (90) (91)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fact (89)m= 1 Mean internation (90)m= 18.79 Mean internation (92)m= 19.34 Apply adjustic (93)m= 19.34 8. Space hear	during hear ctor for gain. Feb 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re 0.98 re in t 9.26 re (for 9.75 mean 9.75	ving area Apr 0.96 iving are 20.65 eriods in 20.12 est of dw 0.94 he rest of 19.71 the who 20.13 internal	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8 of dwelling 20.02 ble dwel 20.41 tempera 20.41	ong a (se J o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14 n (see Table 56 0.38 F2 (follow ste .13 20.14) = fLA × T1 .51 20.52 e from Table .51 20.52	All 0.57 in T 20.0.	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 0, Th2 (°C) 14 20.13 4 0.76 to 7 in Tabl 14 20.07 f — fLA) × T2 52 20.46 where approx 52 20.46	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69 LA = Liv	1 20.28 20.12 0.99 19.19 ving area ÷ (4	Dec 1 20 20.12 1 18.78 4) =	0.45	(86) (87) (88) (89) (90) (91)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fact (89)m= 1 Mean internation (90)m= 18.79 Mean internation (92)m= 19.34 Apply adjustit (93)m= 19.34	during hear ctor for gains Feb 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re 0.98 re in t 9.26 re (for 9.75 mean 9.75 mean ement nal terr	ving are Apr 0.96 iving are 20.65 eriods in 20.12 est of dw 0.94 he rest of 19.71 r the who 20.13 internal 20.13	the livir a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8 of dwelling 20.02 ble dwel 20.41 tempera 20.41 e obtain	ong a (se J o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14 n (see Table 56 0.38 F2 (follow ste .13 20.14) = fLA × T1 .51 20.52 e from Table .51 20.52	All 0.57 in T 20.0.	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 0, Th2 (°C) 14 20.13 4 0.76 to 7 in Tabl 14 20.07 f — fLA) × T2 52 20.46 where approx 52 20.46	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69 LA = Liv	1 20.28 20.12 0.99 19.19 ving area ÷ (4	Dec 1 20 20.12 1 18.78 4) =	0.45	(86) (87) (88) (89) (90) (91)

Apr

May

Jul

Jun

Aug

Mar

Jan

Feb

Oct

Sep

Nov

Dec

l Itilicati	ion facto	r for as	aine hm											
(94)m=		0.99	0.98	0.94	0.81	0.59	0.42	0.49	0.79	0.96	0.99	1		(94)
	gains, hr													, ,
_		64.84	504.77	543.8	516.25	379.24	256.14	267.38	381.5	419.07	410.26	412.38		(95)
Monthl	y averag	e exte	rnal tem	perature	from Ta	able 8		l .			l			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat lo	ss rate f	or mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1	1026.69	91.85	898.06	748.8	578.78	387.28	257.06	269.38	418.8	632.31	841.31	1018.56		(97)
· -	heating I						th = 0.02	24 x [(97))m – (95	- `	 		l	
(98)m=	444.44 3	354.15	292.61	147.6	46.52	0	0	0	0	158.65	310.35	451		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2205.32	(98)
Space	heating i	require	ement in	kWh/m²	/year								31.46	(99)
9a. Enei	rgy requi	remen	ts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space	heating	:												_
Fractio	n of spac	ce hea	t from se	econdar	//supple	mentary	system						0	(201)
Fractio	n of spac	ce hea	t from m	ain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fractio	n of total	heatir	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficier	ncy of ma	ain spa	ce heati	ng syste	em 1								93.5	(206)
Efficier	ncy of se	condar	y/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
Space	heating i	require	ement (c	alculate	d above)									
	444.44 3	354.15	292.61	147.6	46.52	0	0	0	0	158.65	310.35	451		
(211)m :	= {[(98)m	x (20	4)] } x 1	00 ÷ (20	6)									(211)
	475.34 3	78.76	312.95	157.86	49.76	0	0	0	0	169.68	331.93	482.35		
								Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	_	2358.63	(211)
•	heating f	`	•	, , .	month									
	n x (201)												1	
(215)m=	0	0	0	0	0	0	0	0 T-1-	0	0	0	0		7
								rota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water h	_	or boot	or (color	ام امداما	20110)									
	rom wate	67.07	175.57	157.53	154.49	138.19	132.87	145.59	145.27	163.35	172.53	184.99		
Efficienc	cy of wate	er hea	ter									<u> </u>	79.8	(216)
(217)m=	87.01	86.77	86.17	84.64	82.05	79.8	79.8	79.8	79.8	84.74	86.36	87.1		(217)
∟ Fuel for	water he	eating,	kWh/mc	onth			ļ	<u> </u>	ļ	ļ	<u> </u>	<u> </u>		
(219)m :	= (64)m	x 100	÷ (217)	m									l	
(219)m=	217.78 1	92.54	203.75	186.12	188.29	173.17	166.5	182.45	182.05	192.77	199.78	212.38		_
	_							Tota	I = Sum(2			l	2297.59	(219)
Annual Space h	totals neating fu	مور امر	d main	evetem	1					k\	Wh/year	[kWh/year 2358.63	
•	•			Jysieiii	•							[
	eating fu												2297.59	
Electrici	ty for pur	mps, fa	ans and	electric	keep-ho	t								

central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting			311.17	(232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	509.46 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216 =	496.28 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1005.74 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	161.5 (268)
Total CO2, kg/year	sum	of (265)(271) =	1206.17 (272)



			User D	etails: _						
Assessor Name: Software Name:	Stroma FSAP 2	_		Strom Softwa	are Ve	rsion:		Versio	on: 1.0.4.26	
Address :	The Charlie Rate									
1. Overall dwelling dime	nsions:									
Ground floor				a(m²) 39.2	(1a) x		ight(m) 2.8	(2a) =	Volume(m³	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+	·(1e)+(1r	າ) 🔃 :	39.2	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	109.76	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	'у] + [other 0] = [total 0	x ·	40 =	m³ per hou	r (6a)
Number of open flues	0 +	0	 	0	j = F	0	x :	20 =	0	(6b)
Number of intermittent fa	ns				,	0	x	10 =	0	
Number of passive vents					F	0	x	10 =	0	(7b)
Number of flueless gas fi	res				F	0	X e	40 =	0	(7c)
								Air ch	nanges <mark>per</mark> ho	our
Infiltration due to chimney					continue fr	0 rom (9) to (÷ (5) =	0	(8)
Number of storeys in the Additional infiltration Structural infiltration: 0. if both types of wall are prededucting areas of opening	25 for steel or timb				•	ruction	[(9)	-1]x0.1 =	0 0	(9) (10) (11)
If suspended wooden f	• / .	sealed) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter	0							0	(13)
Percentage of windows	and doors draugh	nt stripped							0	(14)
Window infiltration Infiltration rate				0.25 - [0.2] (8) + (10)	. ,	_	± (15) =		0	(15)
Air permeability value,	a50, expressed in	cubic metre	s per ho					area	3	(16)
If based on air permeabili	•		•	•	•			G.1 G G.1	0.15	(18)
Air permeability value applie		t has been dor	ne or a de	gree air pe	meability	is being u	sed			_
Number of sides sheltere Shelter factor	d			(20) = 1 -	0 075 x (1	19)1 =			2	(19)
Infiltration rate incorporat	ing shelter factor			(21) = (18)					0.85	(20)
Infiltration rate modified for	•	eed							0.13	(=1)
	 	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7	-					-		•	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.0	8 0.95	0.95	0.92	1	1.08	1.12	1.18]	

0.16	0.16	e (allowi	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effe		_	rate for t	he appli	cable ca	se se	<u> </u>			<u> </u>	ļ]	
If mechanica												0.5	(2:
If exhaust air h) = (23a)			0.5	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				76.5	(2
a) If balance	ı —					- ` ` 		<u> </u>	2b)m + (23b) × [``	÷ 100]	
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
b) If balance	ı —						<u> </u>	,	<u> </u>		1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00h	. \			
$\frac{11 (220)f}{24c)m=0}$	0.5 x	(23b), t	nen (240	(230) = (230)	o); other	wise (24)	C) = (220)	0) m + 0.	5 × (230	0	0	1	(2
	<u> </u>					<u> </u>			0				(2
d) If natural if (22b)r		on or wn en (24d)			•				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)				ı	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
3. Heat losse					N . A				A >/ L L				
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valu W/m2		A X U (W/I	K)	k-value kJ/m²-l		AXk J/K
oors Type 1	5.11 5 5				2.5	x	1.3	= [3.25	7			(2
oors Type 2					2.5	X	1	-	2.5	Ħ			(2
/indows Type	1				4.1	7 v1	/[1/(1.3)+		5.07	Ħ			(2
/indows Type					2.6		/[1/(1.3)+		3.21	4			(2
/indows Type						_	/[1/(1.3)+	L		=			(2
/alls			- 40	_	1.3	=			1.61	륵 ,			`
	29.1	==	13	_	16.12	=	0.15	= [2.42	亅 ¦		╡	(2
oof	39.2		0		39.2	×	0.1	=	3.92				(3
otal area of e		,			68.32			<i>r</i>					(3
for windows and include the area						ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	1 3.2	
abric heat los							(26)(30)	+ (32) =				21.97	(;
eat capacity	•	`	,					((28)	.(30) + (32	2) + (32a).	(32e) =	0	<u> </u>
hermal mass	^	` ,	P = Cm ÷	- TFA) ir	n kJ/m²K			., ,	tive Value	, , ,	, ,	250	
or design assess	•	,		,			ecisely the	indicative	values of	TMP in Ta	able 1f	200	(
an be used inste						·	•						
nermal bridg	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						3.42	(:
details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(00)	(0.0)				
otal fabric he									(36) =			25.39	(;
	i	i								25)m x (5)	1	1	
	ı Lah	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan	Feb												
Jan	10.03	9.91	9.34	9.22	8.64	8.64	8.53	8.87	9.22	9.45	9.68		(;
	10.03		9.34	9.22	8.64	8.64	8.53		9.22	<u> </u>	9.68		(3

leat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
40)m=	0.91	0.9	0.9	0.89	0.88	0.87	0.87	0.87	0.87	0.88	0.89	0.89		
ء طحسيا	r of do	o in ma	oth /Toh	lo 1o\					,	Average =	Sum(40) ₁	12 /12=	0.89	(40)
Numbe	i	Feb	nth (Tab Mar	· ·	Mov	lup	Jul	Λιια	Con	Oct	Nov	Dec		
41)m=	Jan 31	28	31	Apr 30	May 31	Jun 30	31	Aug 31	Sep 30	31	Nov 30	31		(41)
+1)111=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
4 10/												130/1/		
4. VVa	iter heat	ing enei	rgy requi	irement:								kWh/ye	ar:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13		39		(42
Reduce	the annua	ıl average	hot water	usage by		lwelling is	designed t	(25 x N) to achieve		se target o		7.1		(43
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
44)m=	73.81	71.13	68.44	65.76	63.07	60.39	60.39	63.07	65.76	68.44	71.13	73.81		
_			, ,			400 1//		T (000			m(44) ₁₁₂ =		805.19	(44
								Tm / 3600						
15)m=	109.46	95.73	98.79	86.12	82.64	71.31	66.08	75.83	76.73	89.43	97.61	106		— ,,,
instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage).	enter 0 in	boxes (46)		Total = Su	m(45) ₁₁₂ =	<u> </u>	1055.74	(45
46)m=	16.42	14.36	14.82	12.92	12.4	10.7	9.91	11.37	11.51	13.41	14.64	15.9		(46
	storage		14.02	12.02	12.7	10.7	0.01	11.07	11.01	10.41	14.04	10.0		()
Storag	e volum	e (litres)	includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47
f comr	nunity h	eating a	ınd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage		odarod I	occ foct	or is kno	wo (k\\/k	2/d2v/):							(40
,			m Table		JI 15 KI10	wii (Kvvi	i/uay).					0		(48
•				, kWh/ye	oor			(48) x (49)	١ _			0		(49
			_	-	oss fact	or is not		(40) X (49)	, =		1	10		(50
				-	e 2 (kW						0.	02		(51
	•	•	ee secti	on 4.3										
		from Ta		O.b.							—	03		(52
			m Table						>	>	0	.6		(53
		m water 54) in (5	-	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	_	03		(54 (55
	. ,	,	•	for each	month			((56)m = (55) v (41):	m	1.	.03		(30
1						00.00								(50
56)m=	32.01	28.92	32.01	30.98	32.01 m = (56)m	30.98 x [(50) = (32.01 H11)1 ÷ (5	32.01	30.98 7)m = (56)	32.01 m where (30.98	32.01 m Appendi	ζH	(56
-			ı											/E-
57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57
	•	•		m Table		>	()					0		(58
	•				•		` '	65 × (41)		r 4h a ==== =	otot\			
,			ı —					ng and a				22.20		(59
59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(3:

Combi loss	calculated	for each	month ((61)m –	(60)	· 365 × (41	/m							
(61)m= 0	0	0	0	0 0	00)))	0	0	T 0	0	1	(61)
													J · (59)m + (61)m	(- /
(62)m= 164.7	-	154.06	139.62	137.92	124		131	_	130.23	144.7	151.11	161.28	(39)111 + (01)111	(62)
Solar DHW inpo							ļ						1	,
(add addition						-						· · · · · · · · · · · · · · · · · ·		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(63)
Output from	water hea	ter					!				_ !		1	
(64)m= 164.7		154.06	139.62	137.92	124	.8 121.36	131	1.1	130.23	144.7	151.11	161.28]	
	Į.							Outp	out from wa	ater heat	er (annual)	112	1706.58	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0	.85 × (45)m	า + (6	31)m	n] + 0.8 x	: [(46)n	n + (57)m	+ (59)m	 1]	
(65)m= 80.62	2 71.77	77.07	71.43	71.7	66.	51 66.19	69.	43	68.31	73.96	75.25	79.47]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylind	er is in the	dwell	ling	or hot w	ater is	from com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar	T .	Mar	Apr	May	Ju	ın Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m= 69.26	6 69.26	69.26	69.26	69.26	69.2	26 69.26	69.	26	69.26	69.26	69.26	69.26		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L	9 or L9a), <mark>a</mark>	ılso s	ee	Table 5					
(67)m= 10.66	9.47	7.7	5.83	4.36	3.6	8 3.97	5.1	7	6.93	8.8	10.28	10.95		(67)
App <mark>liance</mark> s (gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uatio	n L13 or L1	3a),	also	see Tal	ole 5				
(68)m= 119.5	3 120.77	117.64	110.99	102.59	94.6	89.42	88.	18	91.31	97.96	106.36	114.25		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L	.15 or L15a), als	o se	ee Table	5				
(69)m= 29.93	3 29.93	29.93	29.93	29.93	29.9	29.93	29.	93	29.93	29.93	29.93	29.93		(69)
Pumps and	fans gains	(Table 5	āa)										_	
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -55.4	1 -55.41	-55.41	-55.41	-55.41	-55.	41 -55.41	-55	.41	-55.41	-55.41	-55.41	-55.41]	(71)
Water heatir	ng gains (T	able 5)											_	
(72)m= 108.3	5 106.8	103.59	99.21	96.37	92.3	88.97	93.	33	94.87	99.4	104.52	106.81		(72)
Total intern	al gains =					(66)m + (67)n	n + (68	3)m +	+ (69)m + (70)m + (71)m + (72))m	_	
(73)m= 282.3		272.7	259.8	247.09	234.	52 226.14	230	.45	236.89	249.94	264.93	275.8		(73)
6. Solar ga														
Solar gains ar		Ü				•	ations	to co		e applica		tion.		
Orientation:	Access F Table 6d		Area m²			Flux Table 6a		т	g_ able 6b	-	FF Table 6c		Gains (W)	
East 0.9							1			_ r				1(70)
		x	1.		× _	19.64] x] ,		0.53	× [0.8	=	2.92	(76)
		×	1.		× L	38.42] x] ,		0.53	× [0.8	╡ -	5.72	[(76)] ₍₇₆₎
_		×	1.		×	63.27] ×] ,		0.53	× [0.8	 -	9.42](76)] ₍₇₆₎
		x	1.		× _	92.28] x] ,	\vdash	0.53	× [0.8	=	13.73](76)] ₍₇₆₎
East 0.9	× 0.3	X	1.	3	X	113.09	X		0.53	X	0.8	=	16.83	(76)

East	م مید آ			.,		٦.,		45.77	1	0.50	– "			47.00	(76)
East	0.9x	0.3		X	1.3] × ¬ .,		15.77	X	0.53	_ X	0.8	_ =	17.23	(76)
East	0.9x	0.3		X	1.3	」 × ¬	<u> </u>	10.22	X	0.53	_ X	0.8	┥╹	16.4	$\frac{1}{1}$ (76)
East	0.9x	0.3		X	1.3	」 × ¬		4.68	X I	0.53	X	0.8	╡ -	14.09	(76)
	0.9x	0.3		X	1.3	」 ×		3.59	X	0.53	X	0.8	_ =	10.95	$= \frac{1}{1} \frac{(76)}{(76)}$
East	0.9x	0.3		X	1.3	X	4	5.59	X	0.53	X	0.8	_ =	6.78	(76)
East	0.9x	0.3		X	1.3	X	2	4.49	X	0.53	X	0.8	_ =	3.64	<u> </u> (76)
East	0.9x	0.3		X	1.3	X	1	6.15	X	0.53	X	0.8	=	2.4	(76)
West	0.9x	0.77		X	4.1	X		9.64	X	0.53	X	0.7	=	20.7	(80)
West	0.9x	0.3		X	2.6	X	1	9.64	X	0.53	X	0.8	=	5.85	(80)
West	0.9x	0.77		X	4.1	X	3	8.42	X	0.53	X	0.7	=	40.5	(80)
West	0.9x	0.3		X	2.6	X	3	8.42	X	0.53	X	0.8	=	11.44	(80)
West	0.9x	0.77		X	4.1	X	6	3.27	X	0.53	X	0.7	=	66.7	(80)
West	0.9x	0.3		x	2.6	X	6	3.27	X	0.53	X	0.8	=	18.83	(80)
West	0.9x	0.77		x	4.1	X	9	2.28	x	0.53	X	0.7	=	97.27	(80)
West	0.9x	0.3		x	2.6	x	9	2.28	X	0.53	X	0.8	=	27.47	(80)
West	0.9x	0.77		x	4.1	X	1	13.09	x	0.53	X	0.7	=	119.21	(80)
West	0.9x	0.3		x	2.6	x	1	13.09	x	0.53	x	0.8		33.66	(80)
West	0.9x	0.77		x	4.1	X	1	15.77	Х	0.53	X	0.7		122.04	(80)
West	0.9x	0.3		x	2.6	X	1	15.77	х	0.53	Х	0.8	=	34.46	(80)
West	0.9x	0.77		x	4.1	х	1	10.22	x	0.53	Х	0.7	=	116.18	(80)
West	0.9x	0.3		x	2.6	j×	1	10.22	x	0.53	X	0.8	=	32.81	(80)
West	0.9x	0.77		x	4.1	x		4.68	Х	0.53	X	0.7	-	99.8	(80)
West	0.9x	0.3	7	x	2.6	i x	9	4.68	X	0.53	Х	0.8	= =	28.18	(80)
West	0.9x	0.77		x	4.1	x	7	3.59	X	0.53	X	0.7	╡ =	77.57	(80)
West	0.9x	0.3		x	2.6	Īx	7	3.59	X	0.53	X	0.8	= =	21.9	(80)
West	0.9x	0.77		x	4.1	i x	4	5.59	X	0.53	X	0.7		48.06	(80)
West	0.9x	0.3		x	2.6	d x		5.59	X	0.53	×	0.8		13.57	(80)
West	0.9x	0.77		x	4.1	i x	=	4.49	X	0.53	×	0.7	╡ -	25.81	(80)
West	0.9x	0.3		x	2.6	d x		4.49	X	0.53	= x	0.8	╡ -	7.29	(80)
West	0.9x	0.77		x	4.1	d x		6.15	X	0.53	= x	0.7	╡ -	17.03	(80)
West	0.9x	0.3		X	2.6] x	_	6.15	X	0.53	X	0.8	╡ -	4.81	(80)
	_	0.0				_			l	0.00					()
Solar ga	ains in	watts, ca	alcula	ted	for each moi	nth			(83)m	ı = Sum(74)m	(82)m				
(83)m=	29.47	57.65	94.9	$\overline{}$	138.47 169.		73.72	165.39	142		68.41		24.24]	(83)
Total ga	ains – ir	nternal a	nd so	olar	(84)m = (73)	m + ((83)m	, watts	!	I	•			J	
(84)m=	311.79	338.47	367.	65	398.28 416.	8 4	108.24	391.53	372	.52 347.32	318.3	5 301.68	300.03]	(84)
7. Mea	an inter	nal temp	eratu	ıre (heating seas	on)									
					eriods in the		area	from Tal	ole 9.	Th1 (°C)				21	(85)
•		•		• •	ving area, h1	_				, ,					
Γ	Jan	Feb	Ma	-	Apr Ma	Ť	Jun	Jul	A	ug Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.98	0.9	$\boldsymbol{-}$	0.88 0.73	- +	0.53	0.38	0.4		0.91	0.98	0.99	1	(86)
Mean	interna	l temner	ature	in li	ving area T1	(follo	nw sta	ns 3 to 7	in T	able 9c)			<u>. </u>		
(87)m=	20.29	20.4	20.6	-	20.83 20.9		21	21	2		20.82	2 20.52	20.27]	(87)
` ′ L	-								<u> </u>				<u> </u>	J	•

T		al				al a III a a	f T.	bla O. T	LO (0 0)					
(88)m=	erature 20.16	20.16	eating p	20.18	20.18	20.19	20.19	20.2	n2 (°C) 20.19	20.18	20.18	20.17		(88)
` '		<u> </u>	ains for						20.19	20.16	20.16	20.17		(00)
(89)m=	0.99	0.98	0.95	0.85	0.68	0.46	0.31	0.35	0.59	0.88	0.97	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)	ı			
(90)m=	19.22	19.39	19.67	19.99	20.14	20.19	20.19	20.2	20.18	19.99	19.58	19.2		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.69	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2			•		
(92)m=	19.96	20.1	20.32	20.57	20.71	20.75	20.75	20.75	20.74	20.57	20.24	19.94		(92)
		i	he mear		· ·									
(93)m=	19.96	20.1	20.32	20.57	20.71	20.75	20.75	20.75	20.74	20.57	20.24	19.94		(93)
•			uirement											
			ternal ter or gains			ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	:										
(94)m=	0.99	0.98	0.95	0.87	0.71	0.51	0.36	0.4	0.64	0.89	0.97	0.99		(94)
			, W = (94	,										(05)
(95)m=	307.74	330.85	349.25	346.12	297.15	207.78	141.2	147.41	221.65	284.62	293.54	296.82		(95)
(96)m=	4.3	age exte	rnal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern											` ′
(97)m=	5 56.5	538.19	487.78	405.3	311.75	209.28	141.34	147.66	227.36	344.99	457.66	552.1		(97)
Space	e heatin	g requir	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m			
(98)m=	185.08	139.33	103.06	42.62	10.86	0	0	0	0	44.91	118.16	189.93		
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	833.95	(98)
Space	e heatin	g requir	ement in	kWh/m²	² /year								21.27	(99)
		•	nts – Cor											
			ace hea from se								unity sch	neme.	0	(301)
	-		from co	-		-	_		., •			[[1	(302)
	-			•	-			allows for	CUD and	un to four	other heat	sources; th		(882)
	-		s, geotherr							ир то тоит с	olner neat	sources, ii	ie iallei	
Fractio	n of hea	at from (Commun	ity boiler	's								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribu	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	g											kWh/y	ear
Annual	space	heating	requiren	nent									833.95	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	= [875.65	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308

Space heating requirement from secon	ndary/supplementary system	(98) x (301) x 10	00 ÷ (308) =		0	(309)
Water heating						J
Annual water heating requirement				17	706.58]
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	1	791.9	(310a)
Electricity used for heat distribution	(e) + (310a)(310e)] =		26.68]`
Cooling System Energy Efficiency Rati					0	(314)
Space cooling (if there is a fixed coolin		= (107) ÷ (314) =	=		0] (315)
Electricity for pumps and fans within dv	welling (Table 4f):					
mechanical ventilation - balanced, extr	act or positive input from outsi	de		1	14.36	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330b)) + (330g) =	1	14.36	(331)
Energy for lighting (calculated in Apper	ndix L)			18	88.22	(332)
40h CO2 Emissions Community has	the management					
12b. CO2 Emissions – Community hea	ating scheme					
12b. CO2 Emissions – Community nea		Energy Whyser	Emission factor			
		Energy «Wh/year	Emission factor		ions 2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)		k Wh/year	kg CO2/kWh	kg CO		(367a)
CO2 from other sources of space and	water heating (not CHP) If there is CHP using two	k Wh/year	kg CO2/kWh	kg CO	2/year](367a)](367)
CO2 from other sources of space and Efficiency of heat source 1 (%)	water heating (not CHP) If there is CHP using two	wh/year uels repeat (363) to (3) x 100 ÷ (367b) x	kg CO2/kWh	kg CO	90	- J
CO2 from other sources of space and Efficiency of heat source 1 (%) CO2 associated with heat source 1	water heating (not CHP) If there is CHP using two ([(307b)+(310b)]	wh/year uels repeat (363) to (3) x 100 ÷ (367b) x	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO	90 640.21	(367)
CO2 from other sources of space and Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	water heating (not CHP) If there is CHP using two to the second of the	wh/year uels repeat (363) to (303) to (303) x 100 ÷ (367b) x x(366) + (368)(372)	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO	90 640.21 13.84	(367)
CO2 from other sources of space and Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community	water heating (not CHP) If there is CHP using two to the secondary) (307b)+(310b) ((313) (363).	wh/year uels repeat (363) to (301) x 100 ÷ (367b) x x(366) + (368)(372)	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO	90 640.21 13.84 654.06	(367) (372) (373)
CO2 from other sources of space and Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (see	water heating (not CHP) If there is CHP using two for a comparison (309) arsion heater or instantaneous	wh/year uels repeat (363) to (301) x 100 ÷ (367b) x x(366) + (368)(372)	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO	90 640.21 13.84 654.06](367)](372)](373)](374)
CO2 from other sources of space and Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (see	water heating (not CHP) If there is CHP using two to the secondary) (307b)+(310b) (313) (363). (309) rsion heater or instantaneous water heating (373)	wh/year uels repeat (363) to (3)] x 100 ÷ (367b) x x (366) + (368)(372) x heater (312) x + (374) + (375) =	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO	90 640.21 13.84 654.06 0](367)](372)](373)](374)](375)
CO2 from other sources of space and Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (see CO2 associated with water from immediate total CO2 associated with space and version of the control c	water heating (not CHP) If there is CHP using two (1) [(307b)+(310b) [(313) systems (363). econdary) (309) rsion heater or instantaneous water heating (373) ups and fans within dwelling (1)	wwh/year uels repeat (363) to (3) (3) x 100 ÷ (367b) x x (366) + (368)(372) x heater (312) x + (374) + (375) = 331)) x	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO	90 640.21 13.84 654.06 0](367)](372)](373)](374)](375)](376)
CO2 from other sources of space and Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (see CO2 associated with water from immediately community) CO2 associated with water from immediately co2 associated with space and co2 associated with electricity for pure	water heating (not CHP) If there is CHP using two (1) [(307b)+(310b) [(313) systems (363). econdary) (309) rsion heater or instantaneous water heating (373) ups and fans within dwelling (1)	wwh/year uels repeat (363) to (3) (3) x 100 ÷ (367b) x x (366) + (368)(372) x heater (312) x + (374) + (375) = 331)) x	kg CO2/kWh 366) for the second fu 0.22 0.52 0 0.22	kg CO	90 640.21 13.84 654.06 0 0 654.06 59.35](367)](372)](373)](374)](375)](376)](378)
CO2 from other sources of space and Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (see CO2 associated with water from immediate total CO2 associated with space and with co2 associated with electricity for pure CO2 associated with electricity for light	water heating (not CHP) If there is CHP using two (307b)+(310b) [(307b)+(310b) [(313) [(313) [(363)] [(309) [(309) [(309) [(309) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(373) [(3	wwh/year uels repeat (363) to (3) (3) x 100 ÷ (367b) x x (366) + (368)(372) x heater (312) x + (374) + (375) = 331)) x	kg CO2/kWh 366) for the second fu 0.22 0.52 0 0.22	kg CO	90 640.21 13.84 654.06 0 0 654.06 59.35](367)](372)](373)](374)](375)](376)](378)](379)

El rating (section 14)

(385)

87.09

		User D	Details:						
Assessor Name:	Ct		Stroma				\/ai-	4 0 4 00	
Software Name:	Stroma FSAP 2012	Property	Softwa Address:				versio	on: 1.0.4.26	
Address :	The Charlie Ratchford Cent					V1 8HF			
1. Overall dwelling dime		,		,, = 0					
		Area	a(m²)		Av. He	ight(m)		Volume(m³)
Ground floor		(39.2	(1a) x	2	2.8	(2a) =	109.76	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (39.2	(4)			_		_
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	(3n) =	109.76	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	٢
Number of chimneys	0 + 0	+	0	=	0	X ·	40 =	0	(6a)
Number of open flues	0 + 0	+	0		0	x :	20 =	0	(6b)
Number of intermittent far	ns	_		Ī	2	x	10 =	20	(7a)
Number of passive vents				Ī	0	x	10 =	0	(7b)
Number of flueless gas fin	res			Γ	0	X 4	40 =	0	(7c)
				_			Air ch	nanges per ho	
	(Co) (Ch) (70) . (7b) . (72)	_		_			_
	/s, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinue fr	20		\div (5) =	0.18	(8)
Number of storeys in th		Ju 10 (17), (ourier wide e	onunao n	0111 (0) 10 (10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame o	r 0.35 fo	r masonr	y constr	ruction			0	(11)
	resent, use the value corresponding t	o the great	ter wall area	a (after					_
deducting areas of opening	<i>lgs); </i>).1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, ent	,	(2232	.,,					0	(13)
Percentage of windows	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
·	ty value, then $(18) = [(17) \div 20] + (18)$							0.43	(18)
	s if a pressurisation test has been do	ne or a deg	gree air pei	meability	is being us	sed			٦
Number of sides sheltere Shelter factor	a		(20) = 1 - [0.075 x (1	19)1 =			2	(19)
Infiltration rate incorporati	ing shelter factor		(21) = (18)		- /1			0.85	(21)
Infiltration rate modified for			(==)	(==)				0.37	(21)
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				•		1	1	J	
 	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
L		1	1		1	1	1	ı	
Wind Factor (22a)m = $(22a)$ m =	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	1	
(22a)m= 1.27 1.25	1.20 1.1 1.00 0.95	0.90	0.84	ı	1.00	1.12	1.10	J	

0.47	0.46	0.45	0.4	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
Calculate effe		•	rate for t	he appli	cable ca	se	ļ		ļ.	<u>. </u>	ļ	<u> </u>	
If mechanica												0	(23
If exhaust air h) = (23a)			0	(23
If balanced with		-	-	_								0	(23
a) If balance		i				, ``	- ^ `-	ŕ	 	` 	1 ` ´	÷ 100] I	(0.
24a)m= 0	0	0	0	0	0	0 (1	0	0	0	0	0		(24
b) If balance	ea mech	anicai ve	entilation 0	without	neat red	covery (i	0 (240	0) m = (22)	2b)m + (23b) ₀	0	1	(24
	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>			0		(2-
c) If whole h				•	o); other				.5 × (23b	o)			
$\frac{(225)!}{(4c)m} = 0$	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	L ventilatio	n or wh	ole hous	L nositiv	ve input	L ventilatio	n from I	oft.	<u> </u>	<u> </u>		J	
					erwise (2				0.5]				
24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)	-		-		
25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(2
3. Heat losse	e and he	at lose i	naramet	or.					_		_		
LEMENT	Gros		Openin		Net Ar	rea	U-vali	IE.	ΑXU		k-value	a a	AXk
	area		m		A ,r		W/m2		(W/	K)	kJ/m ² ·l		kJ/K
oors Type 1					2.5	х	1.2	= [3				(2
oo <mark>rs Type 2</mark>					2.5	X.	1.2	_ = [3				(2
Vindows Type	1				2.46	x1.	/[1/(1.4)+	0.04] =	3.26				(2
Vindows Type	2				1.56	x1.	/[1/(1.4)+	0.04] =	2.07	-			(2
Vindows Type	e 3				0.78	x1.	/[1/(1.4)+	0.04] =	1.03				(27
Valls	29.1	2	9.8		19.32	2 x	0.18	i	3.48				(29
Roof	39.:	2	0	=	39.2	x	0.13	= i	5.1	F i		7 F	(30
otal area of e	lements	, m²			68.32	2							(3
for windows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcui	 lated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	n paragraph	3.2	
* include the area	as on both	sides of in	nternal wal	ls and par	titions								
abric heat los		•	U)				(26)(30)	+ (32) =				20.94	(3
eat capacity		,						((28)	(30) + (3	2) + (32a)	(32e) =	0	(3
hermal mass	•	•		,					tive Value			250	(3
or design asses: an be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge				usina Ar	pendix l	K						3.42	(3
details of therma	•	,		•	•							3.42	(
otal fabric he			, ,	,	,			(33) +	(36) =			24.35	(3
entilation hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 ×	(25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
88)m= 22.08	21.93	21.78	21.07	20.94	20.32	20.32	20.2	20.55	20.94	21.2	21.49		(3
eat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m			
eat transfer of 46.44	defficier 46.28	nt, W/K 46.13	45.42	45.29	44.67	44.67	44.56	(39)m 44.91	= (37) + (45.29	38)m 45.56	45.84		

Heat loss parar	matar (k	JI D) \//	m2k					(40)m	= (39)m ÷	- (4)			
(40)m= 1.18	1.18	1.18	1.16	1.16	1.14	1.14	1.14	1.15	1.16	1.16	1.17		
(40)111= 1.10	1.10	1.10	1.10	1.10	1.14	1.14	1.14			Sum(40) ₁ .		1.16	(40)
Number of days	s in moi	nth (Tab	le 1a)					,	Average =	3um(40)1.	12 / 12=	1.10	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		l				<u> </u>			<u> </u>	!			
4 184 4 1 4											1.50//./		
4. Water heati	ng enei	rgy requi	rement:								kWh/ye	ear:	
Assumed occup if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		39		(42)
Annual average Reduce the annual not more that 125 I	l average	hot water	usage by	5% if the a	welling is	designed t			se target o		7.1		(43)
					_		۸۰۰۰	Con	Oct	Nov	Doo		
Jan Hot water usage in	Feb	Mar day for ea	Apr	May $Vd.m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
							, ,	05.70	CO 44	74.40	70.04		
(44)m= 73.81	71.13	68.44	65.76	63.07	60.39	60.39	63.07	65.76	68.44	71.13	73.81	005.40	— (44)
Energy content of I	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600			ım(44) ₁₁₂ = ables 1b, 1		805.19	(44)
(45)m= 109.46	95.73	98.79	86.12	82.64	71.31	66.08	75.83	76.73	89.43	97.61	106		
(10)= 100.10	00.10	00.10	00.12	02.01	11.01	00.00	70.00			ım(45) ₁₁₂ =		1055.74	(45)
If inst <mark>antane</mark> ous wa	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotal – ou	11(10)112		1000.7 1	(
(46)m= 16.42	14.36	14.82	12.92	12.4	10.7	9.91	11.37	11.51	13.41	14.64	15.9		(46)
Water storage		, , ,		. \	0.44 JD.O								
Storage volume	,							ame ves	sel		150		(47)
If community he	_			_					(01 ! /	(47)			
Otherwise if no		not wate	er (tnis in	iciuaes i	nstantar	neous co	iloa iami	ers) ente	er o in ((47)			
Water storage I a) If manufactu		aclared l	nee facto	nr is kna	wn (k\//k	u/dav/).					20		(48)
•) 13 KHO	WII (ICVVI	i/day).					39		
Temperature fa							(40) (40)				54		(49)
Energy lost fror b) If manufactu		_	-		or is not		(48) x (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community he	-			`		,							. ,
Volume factor f	rom Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fror	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (5	54) in (5	55)								0.	75		(55)
Water storage I	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (<u>I</u> H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3		-		-	-		0		(58)
Primary circuit	loss cal	culated t	or each	month (•	. ,	, ,					ı	
(modified by	factor f	rom Tab	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)		1	
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combiles o	الم ماده المادة	for oo ale		(C1)	(00) . 20	CE (44)	١						
Combi loss c	alculated 0	for each	month	$\frac{(61)m}{0}$	(60) ÷ 30	05 × (41))m 0	T 0	0	Ιο	0	1	(61)
		<u> </u>	<u> </u>							<u> </u>		(E0)m + (61)m	(01)
(62)m= 156.05	.	145.38	131.22	129.23	116.4	112.67	122.42		136.02	142.71	152.6	· (59)m + (61)m]	(62)
Solar DHW inpu				<u> </u>						ļ		1	(02)
(add addition									. contribu	ion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from v	water hea	ter		ļ.		!	<u>. </u>			!		1	
(64)m= 156.05	_	145.38	131.22	129.23	116.4	112.67	122.42	121.83	136.02	142.71	152.6]	
	•			Į.			Ou	tput from w	ater heate	r (annual) ₁	12	1604.35	(64)
Heat gains from	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	١]	
(65)m= 73.67	65.5	70.12	64.71	64.75	59.78	59.25	62.49	61.59	67.01	68.53	72.52		(65)
include (57)m in calc	culation	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a):									
Metabolic gai	ns (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26		(66)
Ligh <mark>ting g</mark> ains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 11.31	10.05	8.17	6.19	4.62	3.9	4.22	5.48	7.36	9.34	10.91	11.63		(67)
App <mark>liance</mark> s g	ains (ca <mark>lc</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble <mark>5</mark>				
(68)m= 119.53	120.77	117.64	110.99	102.59	94.69	89.42	88.18	91.31	97.96	106.36	114.25		(68)
Coo <mark>king g</mark> ain	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5				
(69)m= 29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93		(69)
Pumps and fa	ans gains	(Table 5	5a)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)			_				-	
(71)m= -55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41]	(71)
Water heating		able 5)	•									-	
(72)m= 99.02	97.47	94.25	89.87	87.03	83.03	79.63	83.99	85.54	90.07	95.18	97.48]	(72)
Total interna	-		·)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)		1	
(73)m= 276.64		266.84	253.83	241.02	228.41	220.05	224.43	230.98	244.15	259.22	270.13]	(73)
6. Solar gair				T. I. I. O.							,.		
Solar gains are		•				•	itions to d		ie applicai	ole orientat	tion.	Coina	
Orientation:	Table 6d		Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	Т	able 6c		Gains (W)	
East 0.9x	0.3	x	0.7	70	x 1	19.64	1 x [0.63	x	0.7		1.82	(76)
East 0.9x		^ ^	0.7			38.42	」^ <u>∟</u>] _×	0.63	╣ ,	0.7	=	3.57](76)](76)
East 0.9x		^ ^	0.7			63.27	」^ <u>∟</u>]	0.63	^	0.7	-	5.88](76)
East 0.9x		x	0.7			92.28	」^ <u>∟</u>]	0.63	^	0.7	-	8.57](76)](76)
East 0.9x		x	0.7	==	-	13.09] ^ <u> </u>] _× [0.63	^ x	0.7	_ =	10.5](76)](76)
. U.U.	0.3	^ ^	U.1		··'	10.03	ı ^ L	0.03	^ L	0.1		10.5	J (. °)

East	۰.۰۰				2	_	, —	445.77	1		0.00	٦		\neg	10 ==	(70)
East	0.9x	0.3		X	0.78	=	×	115.77] X		0.63	X	0.7	_ =	10.75	(76)
East	0.9x	0.3		Χ	0.78	=	×	110.22] X]		0.63	X	0.7	_ =	10.24	(76)
East	0.9x	0.3		Χ	0.78	=	×	94.68] X]		0.63	X 	0.7	╡ -	8.79	(76)
East	0.9x	0.3		X	0.78	=	×	73.59] X]		0.63	X 	0.7	=	6.83	(76)
	0.9x	0.3		X	0.78	=	×	45.59	」 X ¬		0.63	×	0.7	_ =	4.23	(76)
East	0.9x	0.3		X	0.78	=	×	24.49	」 X ¬		0.63	X	0.7	╡ -	2.27	(76)
East	0.9x	0.3		X	0.78	╡	×	16.15	」 X ¬		0.63	」 ×	0.7	=	1.5	(76)
West	0.9x	0.77		X	2.46	╡	×	19.64	」 X ¬		0.63	×	0.7	=	14.77	(80)
West	0.9x	0.3		X	1.56	╡	×	19.64	」 X ¬		0.63	×	0.7	=	3.65	(80)
West	0.9x	0.77		X	2.46	╡	×	38.42	」 X ¬		0.63	×	0.7	=	28.88	(80)
West	0.9x	0.3		X	1.56	_	×	38.42	X		0.63	X	0.7	= =	7.14	(80)
West	0.9x	0.77		X	2.46	_ :	×	63.27	X		0.63	X	0.7	=	47.57	(80)
West	0.9x	0.3		X	1.56		×	63.27	X		0.63	X	0.7	=	11.75	(80)
West	0.9x	0.77		X	2.46		x	92.28	X		0.63	X	0.7	=	69.38	(80)
West	0.9x	0.3		X	1.56	:	×	92.28	X		0.63	X	0.7	=	17.14	(80)
West	0.9x	0.77		X	2.46		x	113.09	X		0.63	X	0.7	=	85.02	(80)
West	0.9x	0.3		X	1.56		x	113.09	X		0.63	X	0.7	=	21.01	(80)
West	0.9x	0.77		X	2.46		× \square	115.77	X		0.63	X	0.7	=	87.04	(80)
West	0.9x	0.3		x	1.56	3	x	115.77] x		0.63	x	0.7		21.5	(80)
West	0.9x	0.77		x	2.46		x	110.22] x		0.63	x	0.7	=	82.86	(80)
West	0.9x	0.3		x	1.56		× \square	110.22] x		0.63	x	0.7	=	20.47	(80)
West	0.9x	0.77		x	2.46		x	94.68	Х		0.63	x	0.7	=	71.18	(80)
West	0.9x	0.3		x	1.56		x	94.68	X		0.63	x	0.7	=	17.59	(80)
West	0.9x	0.77		x	2.46		x 🔼	73.59	X		0.63	x	0.7	=	55.32	(80)
West	0.9x	0.3		X	1.56		x	73.59	x		0.63	X	0.7	=	13.67	(80)
West	0.9x	0.77		x	2.46		x $\overline{}$	45.59	x		0.63	x	0.7	=	34.27	(80)
West	0.9x	0.3		x	1.56		x	45.59	X		0.63	×	0.7	=	8.47	(80)
West	0.9x	0.77		x	2.46	$\overline{}$	x 🔚	24.49	X		0.63	x	0.7	_ =	18.41	(80)
West	0.9x	0.3		x	1.56	=	x =	24.49	X		0.63	x	0.7	_ =	4.55	(80)
West	0.9x	0.77		x	2.46	-	x =	16.15	X		0.63	x	0.7	=	12.14	(80)
West	0.9x	0.3		x	1.56	_	x =	16.15	x		0.63	×	0.7		3	(80)
	_								_							
Solar	gains in	watts, ca	alcula	ted	for each m	onth			(83)m	n = Su	ım(74)m	.(82)m			_	
(83)m=	20.24	39.59	65.2	2	95.09 11	6.53	119.2	9 113.57	97.	56	75.83	46.98	25.23	16.64		(83)
Total g	ains – ir	nternal a	nd so	olar	(84)m = (73)	3)m +	(83)	m , watts							-	
(84)m=	296.87	314.65	332.	04	348.92 35	7.56	347.	7 333.62	321	.99	306.81	291.13	3 284.46	286.78		(84)
7. Me	an inter	nal temp	eratu	ıre (heating sea	ason)										
Temp	erature	during h	eatin	g pe	eriods in the	e livin	g are	a from Tal	ble 9	, Th1	l (°C)				21	(85)
Utilisa	ation fac	tor for g	ains f	or li	ving area, l	<u>1,m</u>	(see	Table 9a)							_	
	Jan	Feb	Ma	ar	Apr I	Лау	Jur	n Jul	А	ug	Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.99	0.98	8	0.96 0	.89	0.74	0.57	0.6	61	0.84	0.96	0.99	1]	(86)
Mean	interna	l temper	ature	in li	ving area	1 (fo	llow s	steps 3 to 7	7 in 7	able	9c)					
(87)m=	19.86	19.97	20.1).76	20.93	i	20.		20.87	20.54	20.16	19.84]	(87)
					<u>l</u>	!			-	!				•	•	

-					, -							
Temperature d		.	1		1	1	· · ·	40.00	40.05	10.04		(00)
(88)m= 19.93	19.94 19.94	19.95	19.96	19.97	19.97	19.97	19.96	19.96	19.95	19.94		(88)
Utilisation factor	<u>_</u>	1		· `	1			<u> </u>	<u> </u>		1	(22)
(89)m= 0.99	0.99 0.98	0.94	0.85	0.65	0.45	0.49	0.76	0.95	0.99	0.99		(89)
Mean internal	temperature in	the rest	of dwelli	ing T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)	•		ı	
(90)m= 18.43	18.59 18.91	19.35	19.71	19.92	19.96	19.96	19.86	19.44	18.88	18.42		(90)
							f	fLA = Livin	g area ÷ (4	4) =	0.69	(91)
Mean internal	temperature (f	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 19.42	19.55 19.79	20.14	20.44	20.63	20.67	20.67	20.56	20.21	19.77	19.41		(92)
Apply adjustme	ent to the mea	n interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 19.42	19.55 19.79	20.14	20.44	20.63	20.67	20.67	20.56	20.21	19.77	19.41		(93)
8. Space heati	ng requiremen	nt										
Set Ti to the m the utilisation f		•		ned at sto	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor	or for gains, hr	n:		•	•		•			•	l	
(94)m = 0.99	0.99 0.98	0.95	0.87	0.71	0.53	0.57	0.81	0.95	0.98	0.99		(94)
Us <mark>efu</mark> l gains, h	mGm , W = (9	94)m x (8	4)m									
(95)m= 294.35	310.75 324.46	330.53	312.06	248.06	178	184.59	248.69	276.97	280.15	284.7		(95)
Monthly averag	ge ex <mark>terna</mark> l ter	nperature	from Ta	able 8								
(96)m= 4.3	4.9 6 .5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate			_	Lm , W =		, , ,	– (96)m]				
` '	677.91 613.25		395.69	269.15	181.94	190.21	290.31	435	577.14	697.05		(97)
Space heating				Wh/mon	th = 0.02	24 x [(97)m – (95					
(98)m= 303.37	246.73 214.85	129.54	62.22	0	0	0	0	117.58	213.83	306.78		_
						Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1594.9	(98)
Space heating	requirement in	n kWh/m²	²/year								40.69	(99)
9a. Energy requ		dividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating	•	naandar	v/oupplo	montory	, avatam					ı	0	(201)
Fraction of spa				ineniary	•		(204)				0	 ` ` `
Fraction of spa		•	` '			(202) = 1	` '				1	(202)
Fraction of total	al heating from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of m	ain space hea	ting syste	em 1								93.5	(206)
Efficiency of se	econdary/supp	lementar	y heatin	g systen	า, %						0	(208)
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space heating	requirement (calculate	d above)		•						
303.37	246.73 214.85	129.54	62.22	0	0	0	0	117.58	213.83	306.78		
(211) m = {[(98)r	n x (204)] } x	100 ÷ (20	06)									(211)
324.46	263.88 229.79	138.54	66.55	0	0	0	0	125.75	228.69	328.11		
	•	•		•	•	Tota	l (kWh/yea	ar) =Sum(2	211),,,,5,10,12	<u></u>	1705.77	(211)
Space heating	fuel (seconda	ry), kWh/	month									
= {[(98)m x (201)] } x 100 ÷ (20	08)										
(215)m= 0	0 0	0	0	0	0	0	0	0	0	0		
						Tota	l (kWh/yea	or) -Sum/	04.5\	_		(215)
						1018	ıı (KVVII/yea	ar) =Surri(2	213) _{15,1012}	-	0	(215)

Water heating								
Output from water heater (calculated above)	46.4 440.67	1400.40	404.00	400.00	440.74	450.0	1	
	16.4 112.67	122.42	121.83	136.02	142.71	152.6	70.0	(216)
Efficiency of water heater (217)m= 86.56 86.35 85.85 84.78 82.99 7	79.8 79.8	79.8	79.8	84.43	85.89	86.64	79.8	(217)
` '	79.6	79.6	79.6	64.43	65.69	00.04]	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
·	45.87 141.2	153.41	152.66	161.11	166.15	176.13		
		Tota	I = Sum(2	19a) ₁₁₂ =		-	1916.25	(219)
Annual totals				k'	Wh/year	•	kWh/year	_ _
Space heating fuel used, main system 1							1705.77	╛
Water heating fuel used							1916.25	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30]	(230c)
boiler with a fan-assisted flue						45	j	(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							199.78	(232)
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHF)			_		
				!	6	4	Cuelo elene	
	Energy kWh/year			kg CO:	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2		=	368.45	(261)
Space heating (secondary)	(215) x			0.5		=	0	(263)
Water heating	(219) x			0.2	Ħ	=	413.91](264)
Space and water heating	(261) + (262)	+ (263) + ((264) =	0.2			782.36](265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5		=	103.68](268)
Total CO2, kg/year			sum o	f (265)(2	271) =		924.97	(272)
								_

TER =

(273)

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Versio	on: 1.0.4.26	
		roperty i	Address:				7 5.5.5		
Address :	The Charlie Ratchford Cent					V1 8HF			
1. Overall dwelling dime	nsions:								
		Area	a(m²)		Av. He	ight(m)	_	Volume(m ³)
Ground floor		-	75.5	(1a) x	2	2.8	(2a) =	211.4	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	75.5	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	(3n) =	211.4	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0] = [0	X ·	40 =	0	(6a)
Number of open flues	0 + 0	7 + 🗀	0	=	0	x	20 =	0	(6b)
Number of intermittent far	ns				0	x	10 =	0	(7a)
Number of passive vents				Ē	0	x '	10 =	0	(7b)
Number of flueless gas fin	res			Ē	0	X ·	40 =	0	(7c)
				_		<u> </u>	Air ch	nanges per ho	our —
	ys, flues and fans = (6a)+(6b)+(0		\div (5) =	0	(8)
Number of storeys in the	een ca <mark>rried o</mark> ut or is intended, procee ne dwelling (ns)	iu 10 (17), (ourierwise c	onunue n	om (9) to (10)		0	(9)
Additional infiltration	(13)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	.25 for steel or timber frame o	r 0.35 fo	r masonr	y constr	uction			0	(11)
	resent, use the value corresponding to	o the great	ter wall area	a (after					_
deducting areas of opening	ngs); if equal user 0.35 loor, enter 0.2 (unsealed) or 0	1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, ent	,	· · (ocale	, o.oo	ornor 0				0	(13)
• • • • • • • • • • • • • • • • • • • •	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
•	q50, expressed in cubic metre	•	•	•	etre of e	nvelope	area	3	(17)
·	ity value, then $(18) = [(17) \div 20] + ($							0.15	(18)
	s if a pressurisation test has been do	ne or a deg	gree air per	meability	is being u	sed			¬,,,,
Number of sides sheltere Shelter factor	u		(20) = 1 - [0.0 75 x (1	9)] =			0.85	(19)
Infiltration rate incorporat	ing shelter factor		(21) = (18)		,-			0.13	(21)
Infiltration rate modified for								0.10	` ′
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7					•		_	
 	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22c) = (22	2)m : 4							=	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18]	
()	1 1.00 0.00	1 3.00	1 3.02	•	L	L2		J	

0.16	ation rate (al		0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		•	the appli	cable ca	ise	<u>. </u>		ļ	ļ	Į.		
	al ventilation:										0.5	(2
	eat pump using) = (23a)			0.5	(2
	n heat recovery:										76.5	(2
· —	ed mechanica		1		- 	- ^ ` ` 	ŕ	– `		``	÷ 100]	
4a)m= 0.28	0.28 0.2		0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
· —	ed mechanica		1	1	, , , ,	- ^ ` ` - 	í `	 		1	ı	
4b)m= 0	0 (0	0	0	0	0	0	0	0		(2
,	ouse extract n < 0.5 × (23		•	•				5 × (23b)			
4c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(:
,	ventilation or n = 1, then (2							0.5]				
4d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(
Effective air	change rate	- enter (24a	a) or (24l	o) or (24	c) or (24	d) in bo	x (25)					
5)m= 0.28	0.28 0.2	27 0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(
Heat losse	s and heat lo	oss naramet	er.									-
EMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		A X k kJ/K
oors				2.4	x	1.3	= [3.12				(
in <mark>dows</mark> Type) 1			2.4	x1	/[1/(1.3)+	- 0.04] =	2.97				(
indows Type	2			2.6	x1	/[1/(1.3)+	-0.04] =	3.21	П			(
indows Type	3			2.6	x1	/[1/(1.3)+	- 0.04] =	3.21	٦			(
indows Type	. 4			2.6	<u>x</u> 1	/[1/(1.3)+	- 0.04] =	3.21				(
indows Type	e 5			2.6	x1	/[1/(1.3)+	- 0.04] =	3.21	=			(
indows Type	e 6			2.6	x1	/[1/(1.3)+	- 0.04] =	3.21	=			(
alls Type1	60.48	28.:	2	32.28	3 X	0.15	i	4.84	= [(
alls Type2	20.16	0		20.16	5 x	0.14	=	2.85	=			(
oof	75.5			75.5	x	0.1	≓ ₌¦	7.55	=		7 =	(
otal area of e	elements, m ²			156.1	=							` (
	roof windows, ι		indow U-va			g formula 1	1/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	3.2	•
include the area	as on both sides	of internal wa	lls and par	titions								
bric heat los	ss, $W/K = S$ (,				(26)(30) + (32) =				50.25	(
	Cm = S(A x A x)	•					((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
eat capacity		TMD 0	· TEA\ ir	า kJ/m²K	, L		Indica	tive Value	Medium		250	(
eat capacity nermal mass	parameter (•									
eat capacity nermal mass r design assess n be used inste	sments where that ad of a detailed	ne details of the calculation.	e construct			recisely the	e indicative	values of	TMP in Ta	able 1f		
eat capacity nermal mass or design assess n be used inste	sments where th	ne details of the calculation.	e construct			recisely the	e indicative	values of	TMP in Ta	able 1f	7.78	(

Ventila	tion hea	nt loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	19.54	19.32	19.09	17.98	17.76	16.65	16.65	16.42	17.09	17.76	18.2	18.65		(38)
Heat tr	ansfer c	oefficier	nt, W/K				-	-	(39)m	= (37) + (37)	38)m			
(39)m=	77.56	77.34	77.12	76.01	75.79	74.67	74.67	74.45	75.12	75.79	76.23	76.68		
Heat Ic	ss para	meter (F	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	75.95	(39)
(40)m=	1.03	1.02	1.02	1.01	1	0.99	0.99	0.99	0.99	1	1.01	1.02		
	<u> </u>								,	Average =	Sum(40) ₁	12 /12=	1.01	(40)
Numbe	i		nth (Tab											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
Assum	ed occu	pancy, I	N								2	.37		(42)
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.				` ,
	A £ 13.9	•	otor upoc	no in litro	o par da	\/d o	orogo –	(25 x N)	. 26			1		(40)
								(23 X IN) to achieve		se target o).53		(43)
not m <mark>ore</mark>	e that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot wate	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
44)m=	<mark>9</mark> 9.59	95.97	92.34	88.72	85.1	81.48	81.48	85.1	88.72	92.34	95.97	99.59		
nergy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1086.4	(44)
45)m=	147.68	129.17	133.29	116.2	111.5	96.22	89.16	102.31	103.53	120.66	131.71	143.02		
					_			<u> </u>		Γotal = Su	r m(45) ₁₁₂ =	=	1424.45	(45)
f instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)			•		_
46)m=	22.15	19.37	19.99	17.43	16.72	14.43	13.37	15.35	15.53	18.1	19.76	21.45		(46)
	storage		المارام ما		۸۱ سمیر	//// IDC	.4	م ماطفانی						(47)
_		` ,					•	within sa	ame ves	sei		0		(47)
	-	•	nd no ta		_			(47) ombi boil	ers) ente	er 'O' in <i>(</i>	47)			
	storage		not wate	, (uno n	1014400 1	notantai	10000 00	711101 0011	010) 01110	, , , , , ,	11)			
	-		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Гетре	rature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
			eclared o											
			factor fr		e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
	-	eating s from Tal	ee section	on 4.3										(50)
			m Table	2b								.03		(52) (53)
			storage		ear			(47) x (51)	x (52) x (53) =				, ,
		54) in (5	_	, 12 VII/ y t	Jui			(TI) X (UI)	,			.03		(54) (55)
			culated f	or each	month			((56)m = (55) x (41)ı	m		.00		(55)
1			32.01	30.98		30.00					20.00	22.04		(56)
56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(30)

If cylinder contains	dedicated	d solar sto	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (5	u), eise (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit le	oss (an	nual) fro	m Table	3							0]	(58)
Primary circuit le	•	,			59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified by f	factor fr	om Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)	_	_	
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calc	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat requi	ired for	water he	eating ca	alculated	I for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	า
(62)m= 202.96	179.09	188.56	169.7	166.78	149.71	144.43	157.59	157.03	175.93	185.2	198.3		(62)
Solar DHW input ca	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additional	lines if l	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)				_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from war	ter heat	ter				-	-	-	-	-			
(64)m= 202.96	179.09	188.56	169.7	166.78	149.71	144.43	157.59	157.03	175.93	185.2	198.3		
							Outp	out from w	ater heate	r (annual)	I12	2075.29	(64)
Heat gains from	water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	κ [(46)m	+ (57)m	+ (59)m]	
(65)m= 93.33	82.89	88.54	81.43	81.3	74.79	73.87	78.24	77.22	84.34	86.59	91.78		(65)
include (57)m	n in calc	ulation	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ate <mark>r is fr</mark>	om com	munity h	neating	
5. Internal gain	ns (see	Table 5	and 5a):									
<u> </u>													
Metabolic gains	(Table	5) Wat							-		_	_	
Met <mark>abolic</mark> gains	(Table Feb	5), Wat	ts		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
				May 118.6	Jun 118.6	Jul	Aug 118.6	Sep 118.6	Oct 118.6	Nov 118.6	Dec 118.6		(66)
(66)m= Jan 118.6	Feb 118.6	Mar 118.6	ts Apr 118.6	May 118.6	118.6	118.6	118.6	118.6			 		(66)
Jan	Feb 118.6	Mar 118.6	ts Apr 118.6	May 118.6	118.6	118.6	118.6	118.6			 		(66) (67)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7	Feb 118.6 calculat 16.61	Mar 118.6 ted in Ap 13.51	Apr 118.6 opendix I 10.23	May 118.6 L, equati	118.6 ion L9 or 6.45	118.6 r L9a), a 6.97	118.6 Iso see	118.6 Table 5	1 <mark>18.6</mark> 15.45	118.6	118.6		` ,
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain	Feb 118.6 calculat 16.61	Mar 118.6 ted in Ap 13.51	Apr 118.6 opendix I 10.23	May 118.6 L, equati	118.6 ion L9 or 6.45	118.6 r L9a), a 6.97	118.6 Iso see	118.6 Table 5	1 <mark>18.6</mark> 15.45	118.6	118.6		` ,
Jan (66)m= 118.6 Lighting gains (67)m= 18.7 Appliances gain (68)m= 209.78	Feb 118.6 calculat 16.61 ns (calculated)	Mar 118.6 ted in Ap 13.51 ulated in 206.47	Apr 118.6 opendix I 10.23 Appendix I 194.79	May 118.6 L, equati 7.64 dix L, equali	118.6 ion L9 or 6.45 uation L	118,6 r L9a), a 6.97 13 or L1 156.94	118.6 Iso see 9.06 3a), also	118.6 Table 5 12.17 see Ta	15.45 ble 5	118.6	118.6		(67)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains (reb 118.6 calculat 16.61 ns (calculation) (calculation)	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap	Apr 118.6 opendix I 10.23 Appendix I 194.79	May 118.6 L, equati 7.64 dix L, equali	118.6 ion L9 or 6.45 uation L 166.2 ion L15	118,6 r L9a), a 6.97 13 or L1 156.94	118.6 lso see 9.06 3a), also 154.76	118.6 Table 5 12.17 See Ta 160.25	15.45 ble 5	118.6	118.6		(67) (68)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86	118.6 calculat 16.61 ns (calculations) 211.96 (calculations)	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86	Apr 118.6 opendix I 10.23 Append 194.79 opendix 34.86	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat	118.6 ion L9 or 6.45 uation L	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a)	118.6 Iso see 9.06 3a), also	118.6 Table 5 12.17 see Ta	118.6 15.45 ble 5 171.93	118.6 18.03 186.67	118.6 19.22 200.52		(67)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains (118.6 calculat 16.61 ns (calculations) 211.96 (calculations)	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86	Apr 118.6 opendix I 10.23 Append 194.79 opendix 34.86	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat	118.6 ion L9 or 6.45 uation L 166.2 ion L15	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a)	118.6 lso see 9.06 3a), also 154.76	118.6 Table 5 12.17 See Ta 160.25	118.6 15.45 ble 5 171.93	118.6 18.03 186.67	118.6 19.22 200.52		(67) (68)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86 Pumps and fans	reb 118.6 calculat 16.61 ns (calculat 211.96 (calculat 34.86 s gains 0	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86 (Table 5	Apr 118.6 opendix I 10.23 Appendix 194.79 opendix 34.86 5a)	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 lso see 9.06 3a), also 154.76), also se 34.86	118.6 Table 5 12.17 o see Ta 160.25 ee Table 34.86	15.45 ble 5 171.93 5 34.86	118.6 18.03 186.67 34.86	118.6 19.22 200.52 34.86		(67) (68) (69)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86 Pumps and fans (70)m= 0	reb 118.6 calculat 16.61 ns (calculat 211.96 (calculat 34.86 s gains 0	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86 (Table 5	Apr 118.6 opendix I 10.23 Appendix 194.79 opendix 34.86 5a)	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 lso see 9.06 3a), also 154.76), also se 34.86	118.6 Table 5 12.17 o see Ta 160.25 ee Table 34.86	15.45 ble 5 171.93 5 34.86	118.6 18.03 186.67 34.86	118.6 19.22 200.52 34.86		(67) (68) (69)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86 Pumps and fans (70)m= 0 Losses e.g. eva (71)m= -94.88	reb 118.6 calculat 16.61 ns (calculat 211.96 calculat 34.86 s gains 0 aporatio -94.88	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86 (Table 5 0 n (negat	Apr 118.6 opendix I 10.23 Appendix 194.79 opendix 34.86 5a) 0	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86 0 es) (Tab	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 lso see 9.06 3a), also 154.76 , also se 34.86	118.6 Table 5 12.17 See Ta 160.25 ee Table 34.86	15.45 ble 5 171.93 5 34.86	118.6 18.03 186.67 34.86	118.6 19.22 200.52 34.86		(67) (68) (69) (70)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86 Pumps and fans (70)m= 0 Losses e.g. eva (71)m= -94.88 Water heating g	reb 118.6 calculat 16.61 ns (calculat 211.96 calculat 34.86 s gains 0 aporatio -94.88	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86 (Table 5 0 n (negat	Apr 118.6 opendix I 10.23 Appendix 194.79 opendix 34.86 5a) 0	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86 0 es) (Tab	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 lso see 9.06 3a), also 154.76 , also se 34.86	118.6 Table 5 12.17 See Ta 160.25 ee Table 34.86	15.45 ble 5 171.93 5 34.86	118.6 18.03 186.67 34.86	118.6 19.22 200.52 34.86		(67) (68) (69) (70)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86 Pumps and fans (70)m= 0 Losses e.g. eva (71)m= -94.88 Water heating g	Teb 118.6 calculate 16.61 ins (calculate 211.96 (calculate 34.86 s gains 0 aporatio -94.88 gains (Telepians) 123.35	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86 (Table 5 0 n (negat -94.88 fable 5) 119	Apr 118.6 opendix I 10.23 Appendix 194.79 opendix 34.86 oa) 0 tive value	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86 0 es) (Tab	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 lle 5) -94.88	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 Iso see 9.06 3a), also 154.76 , also se 34.86	118.6 Table 5 12.17 See Ta 160.25 EE Table 34.86	15.45 ble 5 171.93 5 34.86 0	118.6 18.03 186.67 34.86 0 -94.88	118.6 19.22 200.52 34.86 0		(67) (68) (69) (70) (71)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86 Pumps and fans (70)m= 0 Losses e.g. eva (71)m= -94.88 Water heating g (72)m= 125.44 Total internal g	Teb 118.6 calculate 16.61 ins (calculate 211.96 (calculate 34.86 s gains 0 aporatio -94.88 gains (Telepians) 123.35	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86 (Table 5 0 n (negat -94.88 fable 5) 119	Apr 118.6 opendix I 10.23 Appendix 194.79 opendix 34.86 oa) 0 tive value	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86 0 es) (Tab	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 lle 5) -94.88	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 Iso see 9.06 3a), also 154.76 , also se 34.86	118.6 Table 5 12.17 See Ta 160.25 ee Table 34.86 0 -94.88	15.45 ble 5 171.93 5 34.86 0	118.6 18.03 186.67 34.86 0 -94.88	118.6 19.22 200.52 34.86 0		(67) (68) (69) (70) (71)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86 Pumps and fans (70)m= 0 Losses e.g. eva (71)m= -94.88 Water heating g (72)m= 125.44 Total internal g	Feb 118.6 calculate 16.61 ns (calculate 211.96 (calculate 34.86 s gains 0 aporatio -94.88 gains (T 123.35 gains = 410.49	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86 (Table 5 0 n (negat -94.88 able 5) 119	Apr 118.6 opendix I 10.23 Appendix 194.79 opendix 34.86 5a) 0 tive value -94.88	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equati 34.86 0 es) (Tab -94.88	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 lle 5) -94.88	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86 0	118.6 so see	118.6 Table 5 12.17 See Ta 160.25 EE Table 34.86 0 -94.88 107.25 + (69)m +	15.45 ble 5 171.93 5 34.86 0 -94.88 113.36 (70)m + (7	118.6 18.03 186.67 34.86 0 -94.88 120.26 1)m + (72	118.6 19.22 200.52 34.86 0 -94.88 123.36		(67) (68) (69) (70) (71) (72)
Jan (66)m= 118.6 Lighting gains ((67)m= 18.7 Appliances gain (68)m= 209.78 Cooking gains ((69)m= 34.86 Pumps and fans (70)m= 0 Losses e.g. eva (71)m= -94.88 Water heating g (72)m= 125.44 Total internal g (73)m= 412.5	Teb 118.6 calculate 16.61 ns (calculate 34.86) s gains 0 nporation -94.88 gains (Telephone) 123.35 gains = 410.49	Mar 118.6 ted in Ap 13.51 ulated in 206.47 ted in Ap 34.86 (Table 5 0 n (negat -94.88 table 5) 119	118.6 opendix I 10.23 Appendix 194.79 opendix 34.86 5a) 0 tive value -94.88	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equati 34.86 0 es) (Tab -94.88	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 le 5) -94.88 103.87 (66) 335.1	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86 0 -94.88 99.28 m + (67)m 321.78	118.6 so see	118.6 Table 5 12.17 See Ta 160.25 See Table 34.86 0 -94.88 107.25 + (69)m +	15.45 ble 5 171.93 5 34.86 0 -94.88 113.36 (70)m + (7 359.31	118.6 18.03 186.67 34.86 0 -94.88 120.26 1)m + (72) 383.54	118.6 19.22 200.52 34.86 0 -94.88 123.36)m 401.68		(67) (68) (69) (70) (71) (72)

Table 6b

Table 6c

Table 6a

m²

Table 6d

(W)

N. d.		1		i		1				1		_
Northeast _{0.9x}	0.3	X	2.4	Х	11.28	X	0.53	X	0.7	=	2.71	(75)
Northeast _{0.9x}	0.3	X	2.6	X	11.28	X	0.53	X	0.7	=	2.94	(75)
Northeast 0.9x	0.3	X	2.4	X	22.97	X	0.53	X	0.7	=	5.52	(75)
Northeast 0.9x	0.3	X	2.6	X	22.97	X	0.53	X	0.7	=	5.98	(75)
Northeast 0.9x	0.3	X	2.4	X	41.38	X	0.53	X	0.7	=	9.95	(75)
Northeast _{0.9x}	0.3	X	2.6	X	41.38	X	0.53	X	0.7	=	10.78	(75)
Northeast 0.9x	0.3	X	2.4	x	67.96	X	0.53	X	0.7	=	16.34	(75)
Northeast _{0.9x}	0.3	X	2.6	X	67.96	X	0.53	X	0.7	=	17.7	(75)
Northeast 0.9x	0.3	X	2.4	X	91.35	X	0.53	X	0.7	=	21.96	(75)
Northeast 0.9x	0.3	X	2.6	x	91.35	X	0.53	X	0.7] =	23.79	(75)
Northeast _{0.9x}	0.3	X	2.4	x	97.38	x	0.53	X	0.7	=	23.41	(75)
Northeast 0.9x	0.3	X	2.6	x	97.38	X	0.53	X	0.7	=	25.36	(75)
Northeast 0.9x	0.3	x	2.4	х	91.1	X	0.53	X	0.7	=	21.9	(75)
Northeast 0.9x	0.3	x	2.6	x	91.1	x	0.53	x	0.7] =	23.73	(75)
Northeast 0.9x	0.3	x	2.4	x	72.63	x	0.53	x	0.7] =	17.46	(75)
Northeast 0.9x	0.3	x	2.6	х	72.63	x	0.53	x	0.7] =	18.92	(75)
Northeast 0.9x	0.3	x	2.4	x	50.42	x	0.53	x	0.7	=	12.12	(75)
Northeast 0.9x	0.3	X	2.6	X	50.42	Х	0.53	X	0.7		13.13	(75)
Northeast _{0.9x}	0.3	x	2.4	х	28.07	х	0.53	x	0.7	i -	6.75	(75)
Northeast _{0.9x}	0.3	X	2.6	х	28.07	×	0.53	x	0.7	j =	7.31	(75)
Northeast _{0.9x}	0.3	X	2.4	x	14.2	x	0.53	x	0.7	j =	3.41	(75)
Northeast _{0.9x}	0.3	x	2.6	х	14.2	х	0.53	x	0.7	j =	3.7	(75)
Northeast _{0.9x}	0.3	X	2.4	x	9.21	X	0.53	x	0.7	j =	2.22	(75)
Northeast 0.9x	0.3	X	2.6	х	9.21	x	0.53	x	0.7	j =	2.4	(75)
East 0.9x	0.77	x	2.6	x	19.64	x	0.53	x	0.7	j =	26.26	(76)
East 0.9x	0.77	x	2.6	x	19.64	x	0.53	X	0.7	j =	26.26	(76)
East 0.9x	0.77	x	2.6	x	19.64	X	0.53	X	0.7	j =	26.26	(76)
East 0.9x	0.77	X	2.6	х	38.42	X	0.53	X	0.7	j =	51.37	(76)
East 0.9x	0.77	x	2.6	x	38.42	x	0.53	X	0.7	j =	51.37	(76)
East 0.9x	0.77	x	2.6	х	38.42	X	0.53	X	0.7	j =	51.37	(76)
East 0.9x	0.77	X	2.6	х	63.27	X	0.53	X	0.7	i =	84.59	(76)
East 0.9x	0.77	X	2.6	х	63.27	X	0.53	X	0.7	=	84.59	(76)
East 0.9x	0.77	X	2.6	х	63.27	X	0.53	X	0.7	=	84.59	(76)
East 0.9x		X	2.6	х	92.28	X	0.53	X	0.7	i =	123.37	(76)
East 0.9x	0.77	X	2.6	х	92.28	X	0.53	X	0.7	i =	123.37	(76)
East 0.9x		X	2.6	x	92.28	X	0.53	x	0.7	,] =	123.37	(76)
East 0.9x		X	2.6	x	113.09	X	0.53	x	0.7]] =	151.2	(76)
East 0.9x	0.77	X	2.6	x	113.09	X	0.53	x	0.7] =	151.2	(76)
East 0.9x	0.77) X	2.6	x	113.09	X	0.53	x	0.7]] =	151.2	(76)
East 0.9x		X	2.6	x	115.77	l X	0.53	x	0.7]] =	154.78	(76)
East 0.9x		X	2.6	x	115.77	l X	0.53	x	0.7] =	154.78	(76)
- 311	····	1		I	1.5,	I	0.00		· · · · · · · · · · · · · · · · · · ·	ı		」 ` ′

East	0.9x	0.77	1	v		٦.,		45.77	1 .		0.50	٦ ,	0.7	-	45470	(76)
East	0.9x	0.77		X	2.6	」× □		15.77] X]	_	0.53	X 	0.7	_ =	154.78	╡`′
East	L	0.77		X	2.6	_ × □	-	10.22] X]	_	0.53	X	0.7	_ =	147.35	(76)
East	0.9x	0.77		X	2.6	」× □		10.22] X]		0.53	」 ×	0.7	=	147.35	$= \frac{(76)}{(76)}$
East	0.9x	0.77		X	2.6	_		10.22] X]		0.53	X	0.7	_ =	147.35	(76)
	0.9x	0.77		X	2.6	_ X	-	94.68	X	_	0.53	X	0.7	= =	126.58	(76)
East	0.9x	0.77		X	2.6	∐ ×		94.68	X		0.53	→	0.7	= =	126.58	(76)
East	0.9x	0.77		X	2.6	_ ×		94.68	X		0.53	×	0.7	=	126.58	(76)
East	0.9x	0.77		X	2.6	_ ×		'3.59	X		0.53	×	0.7	_ =	98.38	(76)
East	0.9x	0.77		X	2.6	_ ×		73.59	X		0.53	×	0.7	_ =	98.38	(76)
East	0.9x	0.77		X	2.6	→		'3.59	X		0.53	×	0.7	=	98.38	(76)
East	0.9x	0.77		X	2.6	ן ×		5.59	X		0.53	X	0.7	= =	60.95	(76)
East -	0.9x	0.77		X	2.6	_ ×		5.59	X		0.53	X	0.7	=	60.95	(76)
East	0.9x	0.77		X	2.6	_ ×		5.59	Х		0.53	X	0.7	=	60.95	(76)
East	0.9x	0.77		X	2.6	×		24.49	Х		0.53	X	0.7	=	32.74	(76)
East	0.9x	0.77		X	2.6	×		24.49	Х		0.53	X	0.7	=	32.74	(76)
East	0.9x	0.77		X	2.6	x	2	24.49	X		0.53	X	0.7	=	32.74	(76)
East	0.9x	0.77		X	2.6	X		6.15	X		0.53	X	0.7	=	21.59	(76)
East	0.9x	0.77		X	2.6	X		6.15	Х		0.53	X	0.7		21.59	(76)
East	0.9x	0.77		x	2.6	×		6.15] x		0.53	X	0.7	=	21.59	(76)
South	0.9x	0.77		x	2.6	х	4	6.75	x		0.53	X	0.7	=	62.5	(78)
South	0.9x	0.77		x	2.6	X	7	6.57	x		0.53	X	0.7	=	102.37	(78)
Sout <mark>h</mark>	0.9x	0.77		x	2.6	X	é	7.53	Х		0.53	x	0.7	=	130.4	(78)
South	0.9x	0.77		x	2.6	X	1	10.23	X		0.53	x	0.7	=	147.38	(78)
South	0.9x	0.77		x	2.6	×	1	14.87	x		0.53	x	0.7	=	153.58	(78)
South	0.9x	0.77		X	2.6	x	1	10.55	x		0.53	x	0.7	=	147.8	(78)
South	0.9x	0.77		X	2.6	X	1	08.01	X		0.53	X	0.7	=	144.4	(78)
South	0.9x	0.77		X	2.6	x	1	04.89	x		0.53	x	0.7	=	140.24	(78)
South	0.9x	0.77		X	2.6	x	1	01.89	х		0.53	x	0.7	=	136.21	(78)
South	0.9x	0.77		X	2.6	x	8	32.59	x		0.53	x	0.7	=	110.41	(78)
South	0.9x	0.77		X	2.6	x	Ę	55.42	x		0.53	x	0.7	=	74.09	(78)
South	0.9x	0.77		X	2.6	X		40.4	x		0.53	x	0.7	=	54.01	(78)
	_								_							
Solar g	ains in	watts, ca	alcula	ted	for each mo	nth			(83)m	ı = Sur	n(74)m	(82)m			-	
(83)m=	146.93	267.97	404		551.53 652		660.9	632.1	556	.34	456.62	307.3	2 179.42	123.4		(83)
Total g		nternal a		_	(84)m = (73)		(83)m	, watts						,	7	
(84)m=	559.43	678.46	802.	46	928.23 1008	.46	996	953.87	883	.91	794.86	666.6	3 562.96	525.08		(84)
7. Me	an inter	nal temp	eratu	ıre (heating seas	son)										
Temp	erature	during h	eatin	g pe	eriods in the	livin	g area	from Tal	ole 9	, Th1	(°C)				21	(85)
Utilisa	tion fac	tor for g	ains f	or li	ving area, h	1,m (see Ta	ble 9a)						,	7	
	Jan	Feb	Ma	\rightarrow		ay	Jun	Jul	 	ug	Sep	Oct	_	Dec	_	
(86)m=	0.99	0.98	0.9	5	0.84 0.6	7	0.48	0.34	0.3	39	0.63	0.91	0.99	1		(86)
Mean	interna	l temper	ature	in li	iving area T	l (foll	ow ste	ps 3 to 7	7 in T	able	9c)				_	
(87)m=	20.06	20.26	20.5	55	20.83 20.9	96	21	21	2	1	20.98	20.77	20.36	20.02		(87)
•																

T		al				ali i i a Illia ai	. f T.	O T	LO (0 0)					
(88)m=	20.06	20.06	neating p	20.08	20.08	20.09	20.09	20.09	n2 (°C) 20.09	20.08	20.08	20.07		(88)
` '			jains for	ļ	ļ	ļ	<u>!</u>	<u> </u>	20.09	20.06	20.08	20.07		(00)
(89)m=	0.99	0.98	0.93	0.81	0.61	0.41	0.27	0.31	0.56	0.88	0.98	0.99		(89)
Mean	interna	l tempei	rature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to	r 7 in Tabl	le 9c)				
(90)m=	18.82	19.11	19.51	19.89	20.05	20.09	20.09	20.09	20.07	19.83	19.26	18.77		(90)
		•		•		•	•	•	1	fLA = Livin	g area ÷ (4	4) =	0.44	(91)
Mean	interna	l tempei	rature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.36	19.62	19.96	20.3	20.44	20.48	20.49	20.49	20.47	20.24	19.74	19.32		(92)
		1	he mear		· ·		ì	i	· · · ·	·	1			
(93)m=	19.36	19.62	19.96	20.3	20.44	20.48	20.49	20.49	20.47	20.24	19.74	19.32		(93)
•			uirement											
			ternal ter or gains			ed at ste	ep 11 of	Table 9	b, so tha	it Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	:										
(94)m=	0.99	0.98	0.93	0.82	0.63	0.44	0.3	0.34	0.59	0.88	0.98	0.99		(94)
			W = (94)	<u> </u>	_									(05)
(95)m=	554.33	662.13	748.64	759.07	639.72	437.03	290.06	303.94	467.13	589.81	550.96	521.55		(95)
(96)m=	4.3	4.9	ernal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		_	an intern			ļ								, ,
(97)m=	_		1038.28	_	662.68	439.39	290.3	304.4	478.29	730.55	963.31	1159.2		(97)
Space	e heatin	g requir	ement fo	r each n	nonth, kl	/Vh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	456.59	319.88	215.49	77.31	17.08	0	0	0	0	104.71	296.89	474.42		
								Tota	ıl per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1962.37	(98)
Space	e heatin	g requir	ement in	kWh/m²	²/year								25.99	(99)
9b. En	ergy red	quireme	nts – Cor	mmunity	heating	scheme)							
			pace hea t from se								unity sch	neme.	0	(301)
	-		from co	-		-	_	(., •			[1	(302)
	-			-	-			allowa for	CUD and	un to four	other heat	acuraca: H		(002)
	-		ny obtain he s, geotherr							ир то тоиг	other neat	sources, u	ie iallei	
Fractio	n of hea	at from (Commun	ity boiler	rs								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	trol and	charging	method	l (Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribu	ution los	ss factor	(Table 1	2c) for o	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	g										•	kWh/y	ear
Annual	space	heating	requiren	nent									1962.37	
Space	heat fro	om Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	2060.49	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
												•		-

Space heating requirement from secon	dary/supplementary system	(98) x (301) x 10	0 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2075.29	_ _
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (3	305) x (306) =	2179.05	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307e	, , ,		(313)
Cooling System Energy Efficiency Ratio		((()))	, (= ==,	0	(314)
Space cooling (if there is a fixed cooling		= (107) ÷ (314) =	:	0	(315)
Electricity for pumps and fans within dv	· ,				`
mechanical ventilation - balanced, extra		side		196.65	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	ır	=(330a) + (330b)) + (330g) =	196.65	(331)
Energy for lighting (calculated in Apper	ndix L)			330.28	(332)
12b. CO2 Emissions – Community hea					
12b. CO2 Emissions – Community hea		Energy kWh/year	Emission factor	r Emissions kg CO2/year	
CO2 from other sources of space and v	water heating (not CHP)	kWh/year	kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and verticiency of heat source 1 (%)		kWh/year	kg CO2/kWh	kg CO2/year	(367a)
CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1	water heating (not CHP) If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year	(367a) (367)
CO2 from other sources of space and verticiency of heat source 1 (%)	water heating (not CHP) If there is CHP using two	kWh/year fuels repeat (363) to (3	kg CO2/kWh 366) for the second fu	kg CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%) CO2 associated with heat source 1	water heating (not CHP) If there is CHP using two [(307b)+(310b)	kWh/year fuels repeat (363) to (3	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO2/year	(367)
CO2 from other sources of space and verticiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363)	fuels repeat (363) to (303) x 100 ÷ (367b) x) x (366) + (368)(372)	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO2/year sel 90 = 1017.49 = 22	(367)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community is	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309)	kWh/year fuels repeat (363) to (3 b)] x 100 ÷ (367b) x 0 x(366) + (368)(372)	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO2/year el 90 = 1017.49 = 22 = 1039.49	(367) (372) (373)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) [(313) [(363) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(309) [(kWh/year fuels repeat (363) to (3 b)] x 100 ÷ (367b) x 0 x(366) + (368)(372)	kg CO2/kWh 366) for the second fu 0.22 0.52	kg CO2/year sel 90 = 1017.49 = 22 = 1039.49 = 0	(367) (372) (373) (374)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community and co2 associated with space heating (see CO2 associated with water from immerse	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) rsion heater or instantaneous water heating (373)	fuels repeat (363) to (367b) x (366) + (368)(372) x heater (312) x + (374) + (375) =	kg CO2/kWh 366) for the second fu 0.22 0.52 0 0.22	kg CO2/year sel 90 = 1017.49 = 22 = 1039.49 = 0 = 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community and co2 associated with space heating (see CO2 associated with water from immeratoral CO2 associated with space and verifications.	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) rsion heater or instantaneous water heating (373) ups and fans within dwelling	fuels repeat (363) to (367b) x (366) + (368)(372) x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh 366) for the second fu 0.22 0.52 0 0.22	kg CO2/year el	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and verificiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community and CO2 associated with space heating (see CO2 associated with water from immeratoral CO2 associated with space and verification community and c	water heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) systems (363) econdary) (309) rsion heater or instantaneous water heating (373) ups and fans within dwelling	fuels repeat (363) to (367b) x (366) + (368)(372) x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh 366) for the second fu 0.22 0.52 0 0.22	kg CO2/year e	(367) (372) (373) (374) (375) (376) (378)

El rating (section 14)

(385)

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	-			Versic	on: 1.0.4.26	
		Property A	Address:						
Address :	The Charlie Ratchford Cent	re, Belm	ont Stree	t, LONI	OON, NV	V1 8HF			
1. Overall dwelling dime	nsions:								
		Area	a(m²)		Av. He	ight(m)	7	Volume(m ³	_
Ground floor		-	75.5	(1a) x	2	2.8	(2a) =	211.4	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	75.5	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	211.4	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	ns	_			3	x	10 =	30	(7a)
Number of passive vents				Ī	0	x .	10 =	0	(7b)
Number of flueless gas fin	res			Ī	0	X 4	40 =	0	(7c)
				_			A: I-		
				_			Air cn	nanges per ho	our —
	rs, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	30		÷ (5) =	0.14	(8)
Number of storeys in the		eu 10 (17), (ourier wise c	onunde ii	om (9) to (10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame o	r 0.35 fo	r masonr	y constr	uction			0	(11)
	resent, use the value corresponding t	o the great	er wall area	a (after					_
deducting areas of opening	ogs); if equal user 0.35 loor, enter 0.2 (unsealed) or 0) 1 (seale	ed) else (enter 0				0	(12)
If no draught lobby, ent	,	··· (oodie	, o.oo	511101 0				0	(13)
•	and doors draught stripped							0	(14)
Window infiltration	0		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) +	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	es per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] + (18)$	(8), otherwi	ise (18) = (16)				0.39	(18)
	s if a pressurisation test has been do	ne or a deg	gree air per	meability	is being u	sed			_
Number of sides sheltere Shelter factor	a		(20) = 1 - [0.075 x (1	19)1 =			2	(19)
Infiltration rate incorporati	ing shelter factor		(21) = (18)		. •/]			0.85	(20)
Infiltration rate modified for			(=:)	x (=0)				0.33	(21)
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	1 - 1 - 1	•	. <u> </u>	•				l	
 	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
140 1 = 1 (2-1)		1			ı	ı		Ī	
Wind Factor (22a)m = $(22a)$ m =		1 0.05	T 000 T	4	1 4 00	4.40	4.40	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.42	ation rate (a	41 0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39		
Calculate effe		-	the appli	icable ca	ise		<u>!</u>					
If mechanica										Ţ	0	(2
If exhaust air h) = (23a)		Ţ	0	(2
If balanced with										L	0	(2
a) If balance		1	1	i	, ` ` ` 		í `	<u> </u>		- ` 	÷ 100]	,
4a)m= 0		0 0	0	0	0	0	0	0	0	0		(2
b) If balance			1			- ^ ` ` - 	í `	 				
4b)m= 0	<u> </u>	0 0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse extrac n < 0.5 × (23		•	•				5 × (23b)			
4c)m= 0	0	0 0	0	0	0	0	0	0	0	0		(
d) If natural if (22b)n	ventilation on $= 1$, then (0.5]				
4d)m= 0.59	0.59 0.	58 0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(
Effective air	change rate	e - enter (24	a) or (24l	b) or (24	c) or (24	d) in bo	x (25)					
5)m= 0.59	0.59 0.	58 0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(
Heat losse	s and heat l	oss parame	er:							_	_	
LEMENT	Gross area (m²	Openi		Net Ar A ,r		U-val W/m2		A X U (W/I	〈)	k-value		A X k kJ/K
oors	, i			2.4	x	1.2	= [2.88				(
indows Type	e 1			1.53	x1	/[1/(1.4)+	0.04] =	2.03	Ħ			(
indows Type	2			1.66	x1	/[1/(1.4)+	0.04] =	2.2	Ħ			(
indows Type	3			1.66	x1	/[1/(1.4)+	0.04] =	2.2	片			(
indows Type	4			1.66	x1	/[1/(1.4)+	· 0.04] =	2.2				(
indows Type				1.66	= .	/[1/(1.4)+	l.	2.2				(
indows Type				1.66	〓 .	/[1/(1.4)+	l.	2.2				(
alls Type1	60.48	18.8	87	41.61	=	0.18		7.49	╡┌		-	(
alls Type2	20.16		<u>"</u>	20.16	=	0.18	-	3.63	북 ¦		╡	(
oof	75.5			75.5	=	0.13	- - -	9.81	᠆		╡┝	(
otal area of e				156.1	=	0.13		9.01				·)\ (
or windows and			indow U-v			n formula 1	1/[(1/LI-valu	ıe)+0 041 a	ıs aiven in	naragraph	32	(
	as on both side				atou dom	, romaia i	7[(17 0 Valo	10/10:01/4	o givoii iii	paragrapii	0.2	
bric heat los	ss, $W/K = S$	(A x U)				(26)(30) + (32) =			[45.65	(
	Cm = S(A x)	k)					((28)	(30) + (32	2) + (32a).	(32e) =	0	(
eat capacity		TMP = Cm	÷ TFA) iı	n kJ/m²K	, L		Indica	tive Value:	Medium	Ī	250	(
	parameter ((· · · · · ·	•							-		
ermal mass r design assess	sments where t	he details of th	,	tion are no	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
eat capacity nermal mass or design assess n be used inste nermal bridge	sments where to ad of a detailed	he details of the calculation.	e construci			recisely the	e indicative	e values of	TMP in Ta	able 1f	7.78	(1

Ventila	tion hea	at loss ca	alculated	l monthly	У				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	41.17	40.93	40.69	39.56	39.35	38.37	38.37	38.19	38.75	39.35	39.78	40.23		(38)
Heat tr	ansfer o	coefficier	nt, W/K					•	(39)m	= (37) + (37)	38)m			
(39)m=	94.6	94.36	94.12	92.99	92.78	91.8	91.8	91.62	92.18	92.78	93.21	93.65		
Heat Id	ss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	92.99	(39)
(40)m=	1.25	1.25	1.25	1.23	1.23	1.22	1.22	1.21	1.22	1.23	1.23	1.24		
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.23	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ener	rgy requi	rement:								kWh/ye	ear:	
Assum	ed occu	ıpancy, İ	N								2	.37		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		.51		(12)
								(25 x N)).53		(43)
			hot water person per				-	to achieve	a water us	se target o	†			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						Sep	Oct	INOV	Dec		
(44)m=	99.59	95.97	92.34	88.72	85.1	81.48	81.48	85.1	88.72	92.34	95.97	99.59		
Energy o	content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1086.4	(44)
(45)m=	147.68	129.17	133.29	116.2	111.5	96.22	89.16	102.31	103.53	120.66	131.71	143.02		
, ,										Γotal = Su	m(45) ₁₁₂ =	=	1424.45	(45)
If instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(46)m=	22.15	19.37	19.99	17.43	16.72	14.43	13.37	15.35	15.53	18.1	19.76	21.45		(46)
	storage		includin	a any c	olar or M	/\/\LDC	etorago	within sa	mo voc	col		450		(47)
•		` ,	ind no ta				•		aille ves	501		150		(47)
Otherw	•	stored			•			ombi boil	ers) ente	er '0' in (47)			
	•		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(48)
Tempe	rature f	actor fro	m Table	2b		`	• ,					.54		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	.75		(50)
•			eclared o	-										
			factor fr ee section		e 2 (kWl	h/litre/da	ıy)					0		(51)
	-	from Tal		JII 4.3								0		(52)
			m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
•.		(54) in (5	-						•			.75		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)

If cylinder conta	ins dedicate	ed solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	om Append	lix H	
(57)m= 23.33	3 21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circu	uit loss (ar	nnual) fro	om Table	 e 3	•	•					0		(58)
Primary circu	•	,			59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)		_	
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss o	calculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	quired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 194.2	8 171.25	179.88	161.3	158.09	141.31	135.75	148.91	148.62	167.25	176.8	189.62		(62)
Solar DHW inpu	ut calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add addition	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)				_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 194.2	8 171.25	179.88	161.3	158.09	141.31	135.75	148.91	148.62	167.25	176.8	189.62		
	-	-					Outp	out from wa	ater heate	r (annual) ₁	12	1973.06	(64)
Heat gains fr	rom water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m]	
(65)m= 86.38	76.62	81.59	74.71	74.35	68.07	66.92	71.29	70.5	77.39	79.87	84.83		(65)
in <mark>clude</mark> (57	7)m in c <mark>al</mark>	culation	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ins (Table	e 5), Wat	its										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 118.6	3 118.6	118.6	118.6	118.6	118.6	118.6	118.6	118.6	118.6	118.6	118.6		(66)
Lighting gair	ıs (calcula	ited in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 18.7	16.61	13.51	10.23	7.64	6.45	6.97	9.06	12.17	15.45	18.03	19.22		(67)
Appliances of	gains (calc	culated in	n Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5	-	-	•	
(68)m= 209.7	8 211.96	206.47	194.79	180.05	166.2	156.94	154.76	160.25	171.93	186.67	200.52		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	tion L15	or L15a)), also se	ee Table	5	-	-	•	
(69)m= 34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86		(69)
Pumps and f	ans gains	(Table	5a)									•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	on (nega	tive valu	es) (Tab	le 5)	•	•	•		•		•	
(71)m= -94.8	8 -94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88		(71)
Water heating	ng gains (∃	rable 5)	•			•	•	•		•	•	•	
(72)m= 116.1	114.01	109.67	103.77	99.93	94.54	89.95	95.83	97.91	104.02	110.92	114.02		(72)
Total intern	al gains =	• •	!		(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72))m	•	
(73)m= 406.1	6 404.16	391.23	370.36	349.21	328.76	315.44	321.23	331.91	352.98	377.2	395.35		(73)
6. Solar gai	ns:												
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	e applicat	ole orientat	tion.		
Orientation:			Area		Flu			g		FF		Gains	
	Table 6d	l	m²		Tal	ble 6a	Т	able 6b	T	able 6c		(W)	

Northeast 0.9			1		1		1		۱		ı		7(75)
Northeast 0.9		0.3	X	1.53	X	11.28	X	0.63	X	0.7	= 	2.06	(75)
		0.3	X	1.66	X	11.28	X	0.63	X	0.7	= 	2.23	(75)
Northeast 0.9		0.3	X	1.53	X	22.97	X	0.63	X	0.7	= 	4.18	(75)
Northeast 0.9		0.3	X	1.66	X	22.97	X	0.63	X	0.7	= 	4.54	(75)
Northeast 0.9		0.3	X	1.53	X	41.38	X	0.63	X	0.7	=	7.54	(75)
Northeast 0.9		0.3	X	1.66	X	41.38	X	0.63	X	0.7	=	8.18	<u> </u> (75)
Northeast 0.9		0.3	X	1.53	X	67.96	X	0.63	X	0.7	=	12.38	<u> </u> (75)
Northeast 0.9		0.3	X	1.66	X	67.96	X	0.63	X	0.7	=	13.43	<u> </u> (75)
Northeast 0.9		0.3	X	1.53	X	91.35	X	0.63	X	0.7	=	16.64	<u> </u> (75)
Northeast 0.9		0.3	X	1.66	X	91.35	X	0.63	X	0.7	=	18.06	<u> </u> (75)
Northeast 0.9		0.3	X	1.53	X	97.38	X	0.63	X	0.7	=	17.74	(75)
Northeast 0.9		0.3	X	1.66	X	97.38	X	0.63	X	0.7	=	19.25	(75)
Northeast 0.9		0.3	X	1.53	X	91.1	X	0.63	X	0.7	=	16.6	(75)
Northeast 0.9		0.3	X	1.66	X	91.1	X	0.63	X	0.7	=	18.01	(75)
Northeast 0.9		0.3	X	1.53	X	72.63	X	0.63	X	0.7	=	13.23	(75)
Northeast 0.9		0.3	X	1.66	X	72.63	x	0.63	X	0.7	=	14.36	(75)
Northeast 0.9		0.3	X	1.53	X	50.42	X	0.63	X	0.7	=	9.19	(75)
Northeast 0.9		0.3	X	1.66	X	50.42	Х	0.63	X	0.7	=	9.97	(75)
Northeast 0.9		0.3	X	1.53	Х	28.07	×	0.63	X	0.7	=	5.11	(75)
Northeast 0.9	x	0.3	X	1.66	х	28.07	×	0.63	X	0.7	=	5.55	(75)
Northeast 0.9	x	0.3	X	1.53	X	14.2	x	0.63	X	0.7	=	2.59	(75)
Northeast 0.9	x	0.3	x	1.66	x	14.2	Х	0.63	x	0.7	=	2.81	(75)
Northeast 0.9		0.3	x	1.53	x	9.21	X	0.63	x	0.7	=	1.68	(75)
Northeast 0.9	x	0.3	X	1.66	х	9.21	X	0.63	X	0.7	=	1.82	(75)
East 0.9	x	0.77	x	1.66	x	19.64	X	0.63	x	0.7	=	19.93	(76)
East 0.9	x	0.77	x	1.66	x	19.64	X	0.63	x	0.7	=	19.93	(76)
East 0.9	x	0.77	X	1.66	X	19.64	X	0.63	X	0.7	=	19.93	(76)
East 0.9	x	0.77	x	1.66	x	38.42	X	0.63	x	0.7	=	38.98	(76)
East 0.9	x	0.77	x	1.66	x	38.42	X	0.63	x	0.7	=	38.98	(76)
East 0.9	x	0.77	X	1.66	X	38.42	X	0.63	X	0.7	=	38.98	(76)
East 0.9	x	0.77	x	1.66	x	63.27	X	0.63	x	0.7	=	64.2	(76)
East 0.9	x	0.77	×	1.66	x	63.27	x	0.63	x	0.7	=	64.2	(76)
East 0.9	x	0.77	X	1.66	x	63.27	x	0.63	x	0.7	=	64.2	(76)
East 0.9	x	0.77	X	1.66	x	92.28	x	0.63	x	0.7	=	93.63	(76)
East 0.9	x	0.77	X	1.66	X	92.28	x	0.63	x	0.7	=	93.63	(76)
East 0.9	x	0.77	×	1.66	x	92.28	x	0.63	x	0.7	=	93.63	(76)
East 0.9	x	0.77	×	1.66	x	113.09	x	0.63	x	0.7	=	114.75	(76)
East 0.9	x	0.77	×	1.66	x	113.09	x	0.63	x	0.7	=	114.75	(76)
East 0.9	x	0.77	×	1.66	x	113.09	x	0.63	x	0.7	=	114.75	(76)
East 0.9	x	0.77	×	1.66	x	115.77	x	0.63	x	0.7	=	117.46	(76)
East 0.9	x	0.77	X	1.66	x	115.77	x	0.63	X	0.7	=	117.46	(76)

East	0.9x	0.77		X	1.66	X		15 77] _x		2.62	×	0.7		117.46	(76)
East	0.9x	0.77		X	1.66] ^] x		15.77 10.22] ^] x		0.63 0.63	_	0.7	$\dashv $	117.46	(76)
East	0.9x	0.77		X	1.66] ^] x		10.22] ^] _x		0.63	 	0.7	╡ -	111.83	(76)
East	0.9x	0.77		X	1.66] ^] x		10.22] ^] x		0.63	 	0.7	╡ -	111.83	(76)
East	0.9x	0.77		X	1.66] ^] x		4.68] ^] _x		0.63	 	0.7	\dashv	96.06	(76)
East	0.9x	0.77		X	1.66] ^] x		4.68] ^] x		0.63	 	0.7	╡ -	96.06	(76)
East	0.9x			X] ^] x] ^] x			_		╡ -		(76)
East	0.9x	0.77		X	1.66] ^] x		3.59] ^] x	_	0.63 0.63	_	0.7	╡ -	96.06	(76)
East	0.9x	0.77		X	1.66] ^] x] ^] x		0.63	 	0.7	╡ -	74.67	(76)
East	0.9x	0.77		X	1.66] ^] x		3.59 3.59] ^] x		0.63	_	0.7	╡ -	74.67	(76)
East	0.9x	0.77		X	1.66] ^] x		5.59] ^] _x		0.63	 	0.7	╡ -	46.26	(76)
East	0.9x	0.77		X	1.66] ^] x		5.59] ^] x		0.63	 	0.7	╡ -	46.26	(76)
East	0.9x	0.77		X	1.66] ^] x		5.59] ^] _x		0.63	^ x	0.7	╡ -	46.26	(76)
East	0.9x	0.77		X	1.66] ^] x	_	4.49] ^] x		0.63	^ x	0.7	\dashv	24.85	(76)
East	0.9x	0.77		X	1.66] ^] x		4.49] ^] _x		0.63	 	0.7	╡ -	24.85	(76)
East	0.9x	0.77	_	X	1.66] ^] x		4.49] ^] x		0.63	 	0.7	╡ -	24.85	(76)
East	0.9x	0.77		X	1.66] ^] x		6.15] ^] _x		0.63	 	0.7	╡ -	16.39	(76)
East	0.9x	0.77		x	1.66] ^ x		6.15] ^ x		0.63	X	0.7		16.39	(76)
East	0.9x	0.77		X	1.66] ^] x		6.15) ^ x		0.63	X	0.7	= 1	16.39	(76)
South	0.9x	0.77	\blacksquare	X	1.66) ^	-	6.75] ^]		0.63	- x	0.7	╡ -	47.44	(78)
South	0.9x	0.77		X	1.66	1 ^ 1 x	 	6.57] ^ x		0.63	X	0.7		77.69	(78)
South	0.9x	0.77		X	1.66	X		7.53	X		0.63	X	0.7	= =	98.96	(78)
South	0.9x C	0.77		X	1.66	」^ 【	-	_) ^ x	_	0.63	X	0.7	╡ -		(78)
South	0.9x	0.77	-	X	1.66	\ \ \ \ \	\vdash	10.23] ^] x			X	0.7	╡ [111.85	(78)
South	0.9x	0.77	\dashv	X	1.66			10.55] ^] _x		0.63	^ x	0.7	╡ -	112.17	(78)
South	0.9x			X] ^] x		08.01] ^] x		0.63	_		╡ -	109.59	(78)
South	0.9x	0.77	\equiv	X	1.66	」^]		04.89] ^] x		0.63	_	0.7	╡ [109.59	(78)
South	0.9x	0.77	_	X	1.66] ^] x		01.89] ^] x	_	0.63	^ x	0.7	$\dashv $	103.38	(78)
South	0.9x	0.77		X	1.66] ^] x		2.59] ^] x		0.63	_	0.7	= -	83.79	(78)
South	0.9x			X] ^] x] ^] x			_		╡ -		(78)
South	0.9x	0.77			1.66	╡	-	5.42]]	_	0.63	╡	0.7	=	56.23	(78)
Coun	0.91	0.77		X	1.66	X		40.4	X		0.63	X	0.7	=	40.99	(76)
Solar o	aine in i	watte ca	ماديناء	hat	for each mor	ıth			(83)m	ı – Sun	n(74)m	(82)m				
(83)m=	111.51	203.36	307.2	$\overline{}$	418.55 495.4	$\overline{}$	501.55	479.69	422		346.53	233.2	1	93.65	7	(83)
	ains – ir	nternal a	nd so	olar	$\frac{1}{(84)m = (73)i}$	n +	(83)m	, watts	<u>!</u>					<u> </u>	_	
(84)m=	517.67	607.52	698.	5	788.92 844.	7 8	330.31	795.13	743	.43	678.44	586.2	513.37	489	7	(84)
7 Me	an inter	nal temr	eratu	re (heating seas	on)										
					eriods in the I		area	from Tab	ole 9	. Th1	(°C)				21	(85)
•		_		•	ving area, h1	_			- 3	,	· ·/					` ′
230	Jan	Feb	Ma	-	Apr Ma	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	7	
(86)m=	1	0.99	0.98	\dashv	0.94 0.84	- 	0.66	0.5	0.5		0.8	0.96	0.99	1	1	(86)
Mean	internal	l temner	ature	in li	iving area T1	(foll	ow ste	ns 3 to 7	in T	ahle	9c)				_	
(87)m=	19.7	19.88	20.1		20.53 20.8	` —	20.95	20.99	20.		20.89	20.51	20.04	19.67	7	(87)
• •			<u> </u>					<u> </u>	<u> </u>					<u> </u>	_	

Temperature during heating periods in rest of dwelling from Table 9,	
(88)m= 19.88 19.88 19.88 19.89 19.9 19.91 19.91 19.91	1 19.9 19.89 19.89 (88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 1 0.99 0.97 0.91 0.78 0.57 0.38 0.43	0.72 0.94 0.99 1 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 t	o 7 in Table 9c)
(90)m= 18.16 18.43 18.84 19.35 19.72 19.88 19.9 19.9	
	$fLA = Living area \div (4) = 0.44$ (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 -$	fl A) x T2
(92)m= 18.83 19.06 19.42 19.86 20.19 20.35 20.38 20.37	
Apply adjustment to the mean internal temperature from Table 4e, w	rhere appropriate
(93)m= 18.83 19.06 19.42 19.86 20.19 20.35 20.38 20.37	
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table	9b, so that Ti,m=(76)m and re-calculate
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug	g Sep Oct Nov Dec
Utilisation factor for gains, hm:	
(94)m= 0.99 0.99 0.97 0.91 0.8 0.61 0.43 0.48	0.75 0.94 0.99 1 (94)
Useful gains, hmGm , W = (94)m x (84)m	(05)
(95)m= 514.37 599.3 675.76 720.69 672.88 504.15 343.13 358.0	9 507.67 552.24 506.78 486.57 (95)
Monthly average external temperature from Table 8	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4	
Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(93)$ (97) m = 1374.9 1336.1 1216 1019.67 787.82 527.57 346.78 364.1	
(97)m= 1374.9 1336.1 1216 1019.67 787.82 527.57 346.78 364.1 Space heating requirement for each month, kWh/month = 0.024 x [(97)m= 1374.9 1336.1 1216 1019.67 787.82 527.57 346.78 364.1	
(98)m= 640.24 495.13 401.94 215.27 85.51 0 0 0	0 227.61 451.36 655.32
	otal per year (kWh/year) = Sum(98) _{15,912} = 3172.37 (98)
Space heating requirement in kWh/m²/year	42.02 (99)
9a. Energy requirements – Individual heating systems including micro	o-CHP)
Space heating:	
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) =	1 – (201) =
Fraction of total heating from main system 1 (204) =	$(202) \times [1 - (203)] = $ 1 (204)
Efficiency of main space heating system 1	93.5 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Au	g Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)	,
640.24 495.13 401.94 215.27 85.51 0 0 0	0 227.61 451.36 655.32
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
684.75 529.55 429.88 230.23 91.46 0 0 0	0 243.43 482.73 700.88
To the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of th	otal (kWh/year) =Sum(211) _{15,1012} = 3392.91 (211)
Space heating fuel (secondary), kWh/month	
$= \{[(98) \text{m x } (201)] \} \times 100 \div (208)$	
(215)m= 0 0 0 0 0 0 0 0	0 0 0 0
T	otal (kWh/year) =Sum(215) _{15,1012} = 0 (215)

Water heating								
Output from water heater (calculated above) 194.28 171.25 179.88 161.3 158.09 1	41.31 135.75	148.91	148.62	167.25	176.8	189.62		
Efficiency of water heater	ļ .	<u> </u>	l	l		l	79.8	(216)
(217)m= 87.76 87.49 86.9 85.58 83.26	79.8 79.8	79.8	79.8	85.64	87.21	87.86		(217)
Fuel for water heating, kWh/month								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 221.37 195.75 207.01 188.46 189.89 1	77.08 170.12	186.6	186.25	195.3	202.73	215.83		
` '		Tota	l = Sum(2	19a) ₁₁₂ =		<u> </u>	2336.38	(219)
Annual totals				k\	Wh/year	•	kWh/year	
Space heating fuel used, main system 1							3392.91	
Water heating fuel used							2336.38	
Electricity for pumps, fans and electric keep-hot						·		_
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							330.28	(232)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHF)					
	Energy kWh/ye <mark>ar</mark>			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	732.87	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	504.66	(264)
Change and water booting								_
Space and water heating	(261) + (262)	+ (263) + ((264) =				1237.53	(265)
Electricity for pumps, fans and electric keep-hot	(261) + (262) (231) x	+ (263) + ((264) =	0.5	19	=	1237.53 38.93	(265)
	, , , ,	+ (263) + ((264) =	0.5		=		_
Electricity for pumps, fans and electric keep-hot	(231) x	+ (263) + (,		19		38.93	(267)

TER =

(273)

19.18

			User D	etails:						
Assessor Name:				Stroma	a Num	ber:				
Software Name:	Stroma FSAP 201	12		Softwa				Versio	n: 1.0.4.26	
		Pr	operty A	Address:	B79_B	e Lean				
Address :	The Charlie Ratchfo	ord Centre	e, Belm	ont Stree	et, LONE	OON, NV	V1 8HF			
1. Overall dwelling dime	nsions:									
0 10			Area	a(m²)		Av. He		.	Volume(m³)	_
Ground floor				52	(1a) x	2	2.8	(2a) =	145.6	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n))	52	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	145.6	(5)
2. Ventilation rate:										
		econdary neating	/	other		total			m³ per hou	r
Number of chimneys	0 +	0] + [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + 🗀	0	j = <u>F</u>	0	x 2	20 =	0	(6b)
Number of intermittent far	ns		_			0	x -	10 =	0	(7a)
Number of passive vents					Ī	0	x .	10 =	0	(7b)
Number of flueless gas fir	es				Ī	0	X 4	40 =	0	(7c)
								A: I-		
					_		<u> </u>	Air cn	anges per ho	ur —
Infiltration due to chimney					Ļ	0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in th		ea, proceea	to (17), c	otnerwise d	ontinue in	om (9) to (16)		0	(9)
Additional infiltration	e awelling (115)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber	frame or	0.35 for	· masonr	y constr	uction	,	•	0	(11)
if both types of wall are pr		sponding to	the greate	er wall are	a (after					
deducting areas of openin If suspended wooden fl	• /- •	lad) or 0.1	1 (coalo	ud) alsa	ontor O					7(40)
If no draught lobby, ent	,	ieu) oi o.	i (Scalc	iu), eise	enter 0				0	(12)
Percentage of windows	·	tripped							0	(14)
Window infiltration	and doors araugin s	прроц		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cub	oic metres	s per ho	ur per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	ty value, then (18) = [(1	7) ÷ 20]+(8)), otherwi	se (18) = (16)				0.15	(18)
Air permeability value applies	s if a pressurisation test ha	s been done	e or a deg	gree air pei	meability	is being u	sed			_
Number of sides sheltered	d			(00) 4 1	0.075 (4	0)1			2	(19)
Shelter factor	and alterates			(20) = 1 -		9)] =			0.85	(20)
Infiltration rate incorporati				(21) = (18)	X (20) =				0.13	(21)
Infiltration rate modified for Jan Feb	or monthly wind speed Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	1 . 1	<u>J Juli </u>	Jui	Aug	Оер	001	INOV	Dec		
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
				1			1		I	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	?)m ÷ 4 1.23	0.95	0.95	0.92	1	1.08	1.12	1.18		
1.21 1.20	1.1 1.00	1 0.00	0.00	0.02	1	1.00	1.12	1.10	1	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		_	rate for t	he appli	cable ca	se	l	l	l			, 	
If mechanica			o o dio NI (O	Ol-) (OO -			.IE\\ - (b -		\ (00-\			0.5	(23
If exhaust air he) = (23a)			0.5	(23)
If balanced with		-	-	_								76.5	(23
a) If balance						<u> </u>	- ` ` - 	ŕ	– `		- ` ') ÷ 100] 1	(0.4
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	J	(24
b) If balance							r ``	í `	r Ó T		<u> </u>	1	(0.4
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24
c) If whole he				•					5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v if (22b)m				•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25
3. Heat losses	s and he	eat loss	paramete	er:								_	
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Doo <mark>rs Type 1</mark>					2.4	x	1.3	=	3.12				(26
Doo <mark>rs Type 2</mark>					2.5	x	1.3	=	3.25	Ħ			(26
Windows Type	1				2.4	x1	/[1/(1.3)+	0.04] =	2.97	Ħ			(27
Vindows Type	2	l			2.6	x ₁ ,	/[1/(1.3)+	0.04] =	3.21	5			(27
Vindows Type					2.6	x1.	/[1/(1.3)+	0.04] =	3.21	\exists			(27
Valls Type1	33.3	12	12.5		20.82		0.15		3.12	=			(29
Walls Type2	11.4		0	_	11.48	=	0.14	_	1.62	=		╡ ⊨	(29
Roof	52		0	_	52	x $^{\prime}$	0.14	=	5.2	-		-	(30
otal area of e					96.8	= ^	0.1		5.2				(31
for windows and			effective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valı	ıe)+0.041 a	as aiven in	naragraph	132	(51
* include the area						a to a a o		, _{[(1} , 0	,	.o g.v o	paragrap.	. 0.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				25.71	(33
leat capacity	Cm = S(Axk)						((28).	.(30) + (32	2) + (32a).	(32e) =	0	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
For design assess an be used instea				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		_
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix ł	<						4.84	(36
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			30.55	5 (37
entilation hea		alculated	d monthly	/					$= 0.33 \times ($	(25)m x (5))	30.50	, (5)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
38)m= 13.46	13.3	13.15	12.38	12.23	11.47	11.47	11.31	11.77	12.23	12.54	12.84		(38
leat transfer of						<u> </u>		<u> </u>	= (37) + (37)		L	J	•
39)m= 44.01	43.85	43.7	42.93	42.78	42.01	42.01	41.86	42.32	42.78	43.09	43.39	1	
39)[[]= 1 44 []]													

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.85	0.84	0.84	0.83	0.82	0.81	0.81	0.81	0.81	0.82	0.83	0.83		
							ı		Average =	: Sum(40) ₁	12 /12=	0.82	(40)
Number of day	1	nth (Tab	le 1a)		ı	1		1	1				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		75		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		5.74		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage is	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	!	•	•			
(44)m= 83.31	80.28	77.26	74.23	71.2	68.17	68.17	71.2	74.23	77.26	80.28	83.31		
						_				ım(44) ₁₁₂ =		908.89	(44)
Energy content of							OTm / 3600				c, 1d)		
(45)m= 123.55	108.06	111.51	97.22	93.28	80.49	74.59	85.59	86.62	100.94	110.19	119.65		— ,
If inst <mark>antane</mark> ous w	vater heati	ng at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =	_	1191.69	(45)
(46)m= 18.53	16.21	16.73	14.58	13.99	12.07	11.19	12.84	12.99	15.14	16.53	17.95		(46)
Water storage		10.73	14.50	13.33	12.07	11.19	12.04	12.33	15.14	10.55	17.95		(10)
Storage volum	ne (litres) includir	ng any so	olar or <mark>W</mark>	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage			(!	(1.\ \ / /	- /-1 \							(40)
a) If manufact				or is kno	wn (kvvr	n/day):					0		(48)
Temperature f							(10)				0		(49)
Energy lost fro b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stora			-							0.	.02		(51)
If community h	_		on 4.3										
Volume factor										1.	03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	.03		(54)
Enter (50) or (` , ` `	,					((50) ((FE) (44)		1.	.03		(55)
Water storage	loss cal	culated	or each	month	T	1	((56)m = ((55) × (41)	m -				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	5.11	(56)
If cylinder contains	s dedicate	a solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5		/)m = (56)	m where ((H11) IS fro	m Append	X H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit				,	•	• •	, ,						
(modified by			ı —	ı —	ı —			<u> </u>		- 			4
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0 0	0	0	0 1)111 =	00) +	0	0	Т	0	0	T 0	0	1	(61)
													J · (59)m + (61)m	(0.)
(62)m= 178.8	-i	166.79	150.71	148.56	133.9		140.	_	140.11	156.22	` 	174.93	(59)111 + (61)111	(62)
Solar DHW inp													1	(02)
(add addition										CONTINUE	ition to wate	er ricating)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	1	(63)
Output from	water hea	ter										<u> </u>	1	
(64)m= 178.8		166.79	150.71	148.56	133.9	9 129.87	140.	87	140.11	156.22	163.68	174.93]	
	Į	<u> </u>				!	(Outp	ut from wa	ater heat	 er (annual) ₁	112	1842.53	(64)
Heat gains f	rom water	heating.	kWh/me	onth 0.2	3.01 ` 5	35 × (45)m) + (6 ⁻	1)m	1 + 0.8 x	: [(46)n	n + (57)m	+ (59)m	1	_
(65)m= 85.3		81.3	75.12	75.24	69.56		72.6		71.59	77.78	79.43	84.01	1	(65)
include (5	7)m in cal	culation o	of (65)m	only if c	vlinde	r is in the	dwelli	na d	or hot w	ater is	from com	ımunitv h	ı neating	
5. Internal					,			3				• •		
Metabolic ga				, -										
Jar		Mar	Apr	May	Jur	Jul	Αι	ıg	Sep	Oct	Nov	Dec]	
(66)m= 87.45	5 87.45	87.45	87.45	87.45	87.45	87.45	87.4		87.45	87.45	87.45	87.45		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a),	lso se	ee T	able 5					
(67)m= 14.3°	1 12.71	10.33	7.82	5.85	4.94	5.34	6.9	3	9.31	11.82	13.79	14.7]	(67)
Appliances of	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation	L13 or L1	3 a), a	also	see Tal	ole 5			1	
(68)m= 152.4	3 154.01	150.02	141.54	130.83	120.7	6 114.03	112.	45	116.44	124.92	135.63	145.7]	(68)
Cooking gai	ns (calcula	ited in A	ppendix	L, equat	ion L1	5 or L15a), also	o se	e Table	5			'	
(69)m= 31.75	5 31.75	31.75	31.75	31.75	31.75	31.75	31.7	75	31.75	31.75	31.75	31.75	1	(69)
Pumps and	fans gains	(Table 5	 āa)			•	•				•	•	•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•					•	•	•	
(71)m= -69.9	6 -69.96	-69.96	-69.96	-69.96	-69.9	6 -69.96	-69.	96	-69.96	-69.96	-69.96	-69.96		(71)
Water heatir	ng gains (1	able 5)				_		•			•		•	
(72)m= 114.6	5 112.9	109.27	104.33	101.13	96.6	92.77	97.6	69	99.44	104.55	110.32	112.91		(72)
Total intern	al gains =				(66)m + (67)n	า + (68)m +	(69)m + (70)m + (71)m + (72))m	•	
(73)m= 330.6	328.86	318.86	302.93	287.04	271.5	4 261.38	266.	31	274.42	290.53	308.99	322.55		(73)
6. Solar ga	ins:	•				_								
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and ass	ociated equa	tions t	o cor	nvert to th	e applica	able orienta	tion.		
Orientation:			Area			lux			g_ - - - -	_	FF		Gains	
	Table 6d		m²		'	able 6a		1 6	able 6b		Table 6c		(W)	_
South 0.9	× 0.3	X	2.	6	x	46.75	X		0.53	x	0.7	=	12.18	(78)
South 0.9	× 0.3	X	2.	6	x	76.57	X		0.53	x	0.7	=	19.94	(78)
South 0.9	× 0.3	X	2.	6	x	97.53	x		0.53	x [0.7	=	25.4	(78)
South 0.9	x 0.3	X	2.	6	x	110.23	X		0.53	x [0.7	=	28.71	(78)
South 0.9	× 0.3	x	2.	6	x	114.87	x		0.53	x	0.7	=	29.92	(78)

South 0.9x	0.2	x	2.0		X		10 55	1 x		0.52	×	0.7		20.70	(78)
South 0.9x	0.3		2.0				10.55] 1		0.53	╡	0.7	=	28.79	(78)
South 0.9x	0.3	×	2.0		X		08.01] X] v		0.53	→ × → ×	0.7	╡ -	28.13	(78)
South 0.9x	0.3	×	2.0		X		04.89] X] _v		0.53	ן × ק ע	0.7	- -	27.32	= `
0.0.	0.3	X	2.0		X		01.89] X]		0.53	X	0.7	_ =	26.54	(78)
0.0.	0.3	X	2.0		X		2.59	X		0.53	×	0.7	╡ -	21.51	(78)
	0.3	X	2.0		X		5.42	X		0.53	×	0.7	_ =	14.43	(78)
South 0.9x	0.3	X	2.6		X		10.4	X		0.53	×	0.7	=	10.52	(78)
Southwest _{0.9x}	0.3	X	2.4	4	X		6.79]		0.53	×	0.7	=	8.85	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	6	2.67			0.53	X	0.7	_ =	15.07	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	8	5.75]		0.53	×	0.7	=	20.62	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	10	06.25	_		0.53	X	0.7	=	25.54	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	1	19.01]		0.53	X	0.7	=	28.61	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	1	18.15			0.53	X	0.7	=	28.4	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	1	13.91			0.53	X	0.7	=	27.38	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	10	04.39			0.53	X	0.7	=	25.1	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	9	2.85]		0.53	x	0.7	=	22.32	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	6	9.27			0.53	x	0.7	=	16.65	(79)
Sout <mark>hwest_{0.9x}</mark>	0.3	X	2.4	4	X	4	4.07			0.53	X	0.7	=	10.59	(79)
Southwest _{0.9x}	0.3	x	2.4	4	х	3	1.49	Ī ,		0.53	x	0.7		7.57	(79)
West 0.9x	0.3	x	2.0	3	х	1	9.64	x		0.53	Х	0.7	=	5.12	(80)
West 0.9x	0.3	X	2.6	6	x	3	8.42	x		0.53	Х	0.7	=	10.01	(80)
West 0.9x	0.3	x	2.0	5	X	6	3.27	Х		0.53	X	0.7		16.48	(80)
West 0.9x	0.3	x	2.0	3	X	9	2.28	Х		0.53	х	0.7	=	24.03	(80)
West 0.9x	0.3	x	2.0	3	х	1/	13.09	X		0.53	х	0.7		29.45	(80)
West 0.9x	0.3	X	2.0	3	X	=	15.77	X		0.53	x	0.7		30.15	(80)
West 0.9x	0.3	X	2.0		x	1	10.22	X		0.53	×	0.7		28.71	(80)
West 0.9x	0.3	X	2.0		x		4.68) x		0.53	×	0.7	= =	24.66	(80)
West 0.9x	0.3	X	2.0		X	_	3.59]] _X		0.53	╡ ×	0.7	╡ .	19.17	(80)
West 0.9x	0.3	x	2.0		X		5.59]] x		0.53	= x	0.7	= =	11.87	(80)
West 0.9x	0.3	X	2.0		X		4.49]] x		0.53	×	0.7		6.38	(80)
West 0.9x	0.3	x	2.0		x		6.15] ^] _X		0.53	X	0.7	= =	4.21	(80)
0.0%	0.5	^	2.0		^		0.10] ^		0.55	^	0.7		4.21	(00)
Solar gains in	watts ca	alculated	l for eacl	n mont	h			(83)m	ı = Su	m(74)m .	(82)m				
(83)m= 26.14	45.02	62.5	78.29	87.98	$\overline{}$	37.35	84.22	77.	$\overline{}$	68.02	50.03		22.3	1	(83)
Total gains –	nternal a	nd solar	(84)m =	- (73)m	+ (83)m	, watts	<u> </u>				_!		1	
(84)m= 356.76	373.87	381.36	381.22	375.02	3	58.89	345.6	343	.38	342.44	340.5	340.39	344.85]	(84)
7. Mean inte	nal temr	erature	(heating	28320	n)									7	
Temperature			`			area t	rom Tal	ole 9	Th1	(°C)				21	(85)
Utilisation fac	_	٠.			_			J.J 0	,	()					
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec	1	
(86)m= 1	0.99	0.99	0.96	0.89	+	0.72	0.53	0.5	-	0.79	0.95	0.99	1	†	(86)
	Į							<u> </u>				1	L	1	. ,
Mean internation (87)m= 20.27	20.36	20.51	living are	20.88	$\overline{}$	w ste 20.98	ps 3 to <i>1</i> 21	/ IN I	-	9c) 20.96	20.77	20.5	20.26	1	(87)
(01)111= 20.21	20.30	20.51	20.71	20.08		.0.90	<u> </u>		<u>' </u>	20.90	20.77	20.5	20.20	J	(01)

Tamn	aratura	durina l	heating p	ariade in	n rest of	dwelling	from Ta	ahla 0 T	h2 (°C)					
(88)m=	20.21	20.22	20.22	20.23	20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22		(88)
` ′ [gains for		<u> </u>	L	<u> </u>	L						, ,
(89)m=	0.99	0.99	0.98	0.95	0.86	0.65	0.44	0.47	0.73	0.94	0.99	0.99		(89)
Mean	interna	l tempe	rature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)	l	<u> </u>		
(90)m=	19.25	19.37	19.59	19.88	20.11	20.23	20.25	20.25	20.21	19.97	19.58	19.24		(90)
L			1		ı	1	ı	1	1	fLA = Livin	g area ÷ (4	4) =	0.56	(91)
Mean	interna	l tempe	rature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	_A) × T2					
(92)m=	19.82	19.93	20.1	20.34	20.54	20.65	20.67	20.67	20.63	20.42	20.1	19.81		(92)
Apply	adjustr	nent to t	the mear	interna	l temper	ature fro	m Table	4e, whe	ere appr	opriate				
(93)m=	19.82	19.93	20.1	20.34	20.54	20.65	20.67	20.67	20.63	20.42	20.1	19.81		(93)
8. Spa	ace hea	iting req	uirement											
			ternal te	•		ned at ste	ep 11 of	Table 9	b, so tha	ıt Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains					Ι			NI.			
 Litilico	Jan	Feb	Mar gains, hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.99	0.98	0.95	0.87	0.69	0.49	0.52	0.76	0.94	0.98	0.99		(94)
` ' L			W = (9)			0.00	1 0.10	0.02	1 0.70	0.01	0.00	0.00		
(95)m=	354.19		373.47	362.53	327.25	246.42	170.15	177.62	260.64	320.46	335.25	342.8		(95)
	nly aver	age exte	ernal tem	perature	from T	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for me	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]		!		
(97)m=	683.09	658.92	594.43	491.35	378.27	254.25	170.91	178.67	276.39	420.08	559.95	677.42		(97)
Space	e heatin	g requir	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	244.7	194.34	164.39	92.75	37.96	0	0	0	0	74.12	161.79	248.96		
								Tota	ıl per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1219	(98)
Space	e heatin	g requir	ement in	kWh/m²	²/year								23.44	(99)
9b. Ene	ergy red	quireme	nts – Co	mmunity	heating	scheme	;							
			pace hea	•		_		.	•		unity sch	neme.		
Fractio	n of spa	ace hea	t from se	condary	/suppler	nentary i	neating	(Table 1	1) 'U' if n	one			0	(301)
Fractio	n of spa	ace heat	t from co	mmunity	system	1 – (30	1) =						1	(302)
	-		ay obtain h							up to four	other heat	sources; ti	he latter	
			s, geotheri Commun			rom powe	r stations.	See Appe	naix C.				1	(303a)
			heat fro	•		oilers				(3	02) x (303	a) =	1	(304a)
		•	charging		•		r commi	unity hea	atina svs		, ,	,	1	(305)
			· (Table ′		,	,		•	9 0,0				1.05	
			(1000	120) 101 (Jonninan	nty Houtin	ng cyclo							
Space Annual		_	requiren	nent									kWh/ 1219	-
Space	heat fro	om Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	1279.9	95 (307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
	-			Í	J	-	`			-	•			

Space heating requirement from secondary/supplementary sy	ystem (98) x (301) x 100 ÷ (308) =	Γ	0	(309)
Water heating Annual water heating requirement		Γ	1842.53	- 7
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306)	_	1934.66	」 ☐(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)		32.15](313)
Cooling System Energy Efficiency Ratio			0	」` ′ □(314)
Space cooling (if there is a fixed cooling system, if not enter 0	= (107) ÷ (314) =		0	」` ′ □(315)
Electricity for pumps and fans within dwelling (Table 4f):	,	L		
mechanical ventilation - balanced, extract or positive input fro	m outside		135.44	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =		135.44	(331)
Energy for lighting (calculated in Appendix L)			252.67	(332)
12b. CO2 Emissions – Community heating scheme				
12b. CO2 Emissions – Community heating scheme	3,	n factor E		
	kWh/year kg CO2/		missions g CO2/year	
CO2 from other sources of space and water heating (not CHF	kWh/year kg CO2/	kWh k		(367a)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) If there is CHP us	kWh/year kg CO2/	kWh k	g CO2/year](367a)](367)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) If there is CHP us	kWh/year kg CO2/l	second fuel	g CO2/year	
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307)]	kWh/year kg CO2/ Sing two fuels repeat (363) to (366) for the 0)+(310b)] x 100 ÷ (367b) x 0.22	second fuel =	90 771.51	(367)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307) Electrical energy for heat distribution	kWh/year kg CO2/losing two fuels repeat (363) to (366) for the b)+(310b)] x 100 ÷ (367b) x 0.22	second fuel = = =	90 771.51 16.68	(367)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(307) Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/ sing two fuels repeat (363) to (366) for the 0)+(310b)] x 100 ÷ (367b) x 0.22 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0	second fuel = = = =	90 771.51 16.68 788.19	(367) (372) (373)
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year kg CO2/ Sing two fuels repeat (363) to (366) for the b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) (309) x	second fuel = = = = =	90 771.51 16.68 788.19	(367) (372) (373) (374)
CO2 from other sources of space and water heating (not CHE Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal	kWh/year kg CO2/ sing two fuels repeat (363) to (366) for the b)+(310b)] x 100 ÷ (367b) x 0.22 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 neous heater (312) x 0.22 (373) + (374) + (375) =	second fuel = = = = =	90 771.51 16.68 788.19 0	(367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not CHE Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating	kWh/year kg CO2/ sing two fuels repeat (363) to (366) for the b)+(310b)] x 100 ÷ (367b) x 0.22 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 neous heater (312) x 0.22 (373) + (374) + (375) =	second fuel = = = = = = =	90 771.51 16.68 788.19 0 0	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not CHE Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year kg CO2/ sing two fuels repeat (363) to (366) for the 0)+(310b)] x 100 ÷ (367b) x 0.22 [(313) x 0.52 (363)(366) + (368)(372) (309) x 0 neous heater (312) x 0.22 (373) + (374) + (375) = elling (331)) x 0.52	second fuel = = = = = = = = =	90 771.51 16.68 788.19 0 788.19	(367) (372) (373) (374) (375) (376) (378)

El rating (section 14)

(385)

		User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Versic	on: 1.0.4.26	
			Address:						
Address:	The Charlie Ratchford Cent	re, Belm	ont Stree	et, LONI	DON, NV	V1 8HF			
1. Overall dwelling dime	nsions:	۸ro	a(m²)		Av. Hei	iaht(m)		Volume(m³	\
Ground floor		Ale	<u> </u>	(1a) x		2.8	(2a) =	145.6) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)		(4)]` ′		`` ′
Dwelling volume	2, . (. 2, . (. 2, . (. 2, . (. 2,	,	JZ)+(3c)+(3d	l)+(3e)+	.(3n) =	145.6	(5)
						, , ,	,	143.0	
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	r
Number of chimneys	heating heating	- + -	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	╣ + ⊨	0]	0	x 2	20 =	0	(6b)
Number of intermittent far	 ns			,	2	x ·	10 =	20	(7a)
Number of passive vents				F	0	x :	10 =	0	(7b)
Number of flueless gas fir	res			F	0	X 4	40 =	0	(7c)
				_		<u> </u>	Air ch	nanges per ho	ur —
	/s, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6a)+(6b)+(6b)+(6a)+(6a)+(6b)+(6b)+(6a)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.14	(8)
Number of storeys in the	een ca <mark>rried out or is intended, procee</mark> ne dwelling (ns)	ea to (17), (otnerwise c	ontinue tr	om (9) to (16)		0	(9)
Additional infiltration	io differential (115)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame o	r 0.35 fo	r masonr	y constr	uction	,	•	0	(11)
	esent, use the value corresponding t	o the great	ter wall area	a (after					
deducting areas of openin	gs); if equal user 0.35 loor, enter 0.2 (unsealed) or 0	1 (coole	ad) also	ontor O					7(40)
If no draught lobby, ent	,	. i (Seale	eu), eise i	enter 0				0	(12)
	and doors draught stripped							0	(14)
Window infiltration	and doors dradgin suipped		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) +	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ty value, then $(18) = [(17) \div 20] + (18)$	(8), otherwi	ise (18) = (16)				0.39	(18)
	s if a pressurisation test has been do	ne or a de	gree air per	meability	is being us	sed			
Number of sides sheltere	d		(20) – 1	0 075 v (4	10)1 –			2	(19)
Shelter factor	in a shaltar factor		(20) = 1 - [19)] =			0.85	(20)
Infiltration rate incorporati	_		(21) = (18)	X (20) =				0.33	(21)
Infiltration rate modified fo		1		Con	0-4	Nov	Daa		
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spo	eed from Table 7 4.9	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	T.0 4.4 4.3 3.8] 3.6	3.1	4	4.3	ل ^{4.3}	4.1		
Wind Factor (22a)m = (22	2)m ÷ 4						,	•	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.42	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.39]	
Calculate effec		_	rate for t	he appli	cable ca	se	l				!	, 	
If mechanica			l' N (0	01) (00	\ .	(1	15// (1	. (00)	\ (00 \			0	(23
If exhaust air he) = (23a)			0	(23
If balanced with		•	-	_								0	(23
a) If balance		i				<u> </u>	- 	ŕ	, 	- 	1 ` '	i ÷ 100] 1	(0
(24a)m= 0		0	0	0	0	0	0	0	0	0	0	J	(24
b) If balance							r Ó Ì	í `	r ´ `			1	(2)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24
c) If whole he if (22b)m				-	-				5 × (23b)	_		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v if (22b)m				•	•				0.5]				
(24d)m= 0.59	0.58	0.58	0.57	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57]	(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)	-	-			
(25)m= 0.59	0.58	0.58	0.57	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(2
3. Heat losses	s and he	eat loss	paramete	er:							_	_	_
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value		A X k kJ/K
Doo <mark>rs Ty</mark> pe 1					2.4	×	1.2	=	2.88				(26
Doo <mark>rs Ty</mark> pe 2					2.5	x	1.2	=	3	Ħ			(26
Windows Type	1				2.4	x1.	/[1/(1.4)+	0.04] =	3.18	Ħ			(27
Windows Type	2				2.6	x ₁ ,	/[1/(1.4)+	0.04] =	3.45	5			(27
Windows Type	3				2.6	x ₁ ,	/[1/(1.4)+	0.04] =	3.45	Ħ			(27
Walls Type1	33.3	32	12.5		20.82	<u> </u>	0.18	i	3.75	Ħ ſ			(29
Walls Type2	11.4		0	=	11.48	=	0.18	=	2.07	≓ i			(29
Roof	52			=	52	x	0.13		6.76	=		-	(30
Total area of e					96.8	=	0.10		0.10				(3.
* for windows and		•	ffective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	ı 3.2	(0
** include the area						_							
Fabric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				28.5	3 (3:
Heat capacity (Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34
Thermal mass	parame	eter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
For design assess can be used instea				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	•	,		• .	•	<						4.84	(36
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			33.3	7 (37
Ventilation hea	t loss ca	alculated	l monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 28.26	28.09	27.93	27.18	27.03	26.37	26.37	26.25	26.63	27.03	27.32	27.62		(38
Heat transfer c	oefficier	nt, W/K					-	(39)m	= (37) + (38)m		-	
(39)m= 61.63	61.46	61.3	60.55	60.4	59.74	59.74	59.62	60	60.4	60.69	60.99		
Stroma FSAP 201	2 Version:	: 1.0.4.26 (SAP 9.92)	- http://w	ww.stroma	.com	•	•	Average =	Sum(39) ₁	12 /12=	60.5	Page 2 of 34

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
0)m= 1.19	1.18	1.18	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.17	1.17		
umber of day	s in mor	oth (Tabl	le 1a)					,	Average =	Sum(40) ₁ .	12 /12=	1.16	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
4. Water heat	ing ener	gy requi	rement:								kWh/ye	ear:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		75		(42
nnual average educe the annua of more that 125	e hot wa I average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.74		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m= 83.31	80.28	77.26	74.23	71.2	68.17	68.17	71.2	74.23	77.26	80.28	83.31		_
nergy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600		Total = Su oth (see Ta	, ,		908.89	(44
5)m= 123.55	108.06	111.51	97.22	93.28	80.49	74.59	85.59	86.62	100.94	110.19	119.65		
-,									Total = Su			1191.69	(4
inst <mark>antane</mark> ous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)					_
6)m= 18.53	16.21	16.73	14.58	13.99	12.07	11.19	12.84	12.99	15.14	16.53	17.95		(46
/ater storage torage volum		includin	na anv so	olar or M	/WHRS	storage	within sa	me ves	امء		150		(4
community h	,										130		(4)
therwise if no	•			_			. ,	ers) ente	er '0' in (47)			
/ater storage													
i) If manufacti				or is kno	wn (kWh	n/day):				1.	39		(4
emperature fa										0.	54		(4
nergy lost fro		•			:-		(48) x (49)	=		0.	75		(5
) If manufactor ot water stora 			-								0		(5
community h	-			• (,,					<u> </u>		(-
olume factor	from Tal	ble 2a									0		(5
emperature fa	actor fro	m Table	2b								0		(5
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(5
Inter (50) or (54) in (5	55)								0.	75		(5
ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)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		(5
cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	x H	
7)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		(5
rimary circuit	loss (an	nual) fro	m Table	3	<u> </u>	<u> </u>	<u> </u>	<u> </u>			0		(5
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
			–	`				مالد مالد م		-4-4\			
(modified by	tactor fr	om Labi	e H5 if t	here is s	solar wat	er neatii	ng and a	cylinae	r tnermo	stat)			

Combi loss o	alaulata d	for oach	month ((61)m –	(60) · 2(SE (41)	\m						
(61)m= 0	0 0	0	0	0 0	00) + 30	05 x (41)	0	T 0	0	0	0	1	(61)
			<u> </u>	<u> </u>								J · (59)m + (61)m	` /
(62)m= 170.1	-	158.1	142.31	139.88	125.59	121.18	132.19		147.54	155.28	166.25]	(62)
Solar DHW inpu		using App	L endix G oı	r Appendix	H (negati	ve quantity	y) (enter	0' if no sola	r contribut	tion to wate	r heating)]	
(add addition											-		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter						-				•	
(64)m= 170.1	5 150.15	158.1	142.31	139.88	125.59	121.18	132.19	131.71	147.54	155.28	166.25		_
							Ou	tput from w	ater heate	r (annual)	12	1740.31	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	<u>[</u>]	
(65)m= 78.36	69.6	74.35	68.4	68.29	62.84	62.08	65.74	64.87	70.84	72.71	77.06		(65)
include (5	7)m in cald	culation	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):									
Metabolic ga	ins (Table	5), Wat	ts			1	,		,		1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_	
(66)m= 87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45		(66)
Ligh <mark>ting g</mark> air		ted in Ap	_			r L9a), a		Table 5				,	
(67)m= 14.31	12.71	10.33	7.82	5.85	4.94	5.34	6.93	9.31	11.82	13.79	14.7		(67)
App <mark>liance</mark> s g	,	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			_	
(68)m= 152.4	3 154.01	150.02	141.54	130.83	120.76	114.03	112.45	116.44	124.92	135.63	145.7		(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also s	see Table	5			_	
(69)m= 31.75	31.75	31.75	31. <mark>75</mark>	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75		(69)
Pumps and f	fans gains	(Table 5	5a)			1					1	7	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	T			T	т	T	7	
(71)m= -69.9		-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	J	(71)
Water heating		able 5)		,		,	,		,			-	
(72)m= 105.3	2 103.57	99.94	95	91.79	87.27	83.44	88.35	90.1	95.21	100.99	103.58]	(72)
Total intern	_ _							+ (69)m +	· · · · · ·			1	
(73)m= 324.2		312.53	296.59	280.7	265.21	255.04	259.98	268.08	284.19	302.65	316.22	<u> </u>	(73)
6. Solar gai			fl f	Table Ca		:				-1	.:		
Solar gains ar Orientation:		Ü	Area		and assoc Flu		itions to (ie applicai	ole oriental	iion.	Gains	
Onemation.	Table 6d		Mea m ²			ble 6a		g_ Table 6b	Т	able 6c		(W)	
South 0.9	0.3	×	2.	6	x 4	16.75] _x [0.63	x	0.7		14.47	(78)
South 0.93		x	2.	==		76.57] ^ <u> </u>] _x [0.63	^ x	0.7	-	23.7](78)
South 0.93		^ ^	2.			97.53] ^ <u> </u>] _x [0.63	^	0.7	-	30.19](78)
South 0.9		^ ^	2.			10.23	」^ <u>∟</u>]	0.63	^	0.7		34.13](78)
South 0.93		^ ^	2.		<u> </u>	14.87	」^ <u>∟</u>]	0.63	^	0.7		35.56](78)
2.2 0.3/	0.3	^ ^		<u> </u>	^	14.07	」^∟	0.03	^ L	0.7		33.30	J(, 0)

South 0.9x								1 1						(70)
	0.3	X	2.0		X	_	10.55	X	0.63	×	0.7	=	34.22	(78)
South 0.9x South 0.9x	0.3	X	2.0		X		08.01	X	0.63	×	0.7	=		(78)
- · · · · · · · · · · · · · · · · · · ·	0.3	X	2.0		X		04.89	X	0.63	×	0.7	=	32.47	(78)
South 0.9x	0.3	X	2.6	5	X	10	01.89	X	0.63	×	0.7	=	31.54	(78)
South 0.9x	0.3	X	2.0	3	X	8	2.59	X	0.63	×	0.7	=	25.57	(78)
South 0.9x	0.3	X	2.6	5	X	5	5.42	X	0.63	X	0.7	=	17.16	(78)
South 0.9x	0.3	X	2.0	3	X		10.4	X	0.63	X	0.7	=	12.51	(78)
Southwest _{0.9x}	0.3	X	2.4	4	X	3	6.79		0.63	X	0.7	=	10.51	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	6	2.67		0.63	X	0.7	=	17.91	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	8	5.75		0.63	X	0.7	=	24.51	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	10	06.25		0.63	X	0.7	=	30.36	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	1	19.01		0.63	X	0.7	=	34.01	(79)
Southwest _{0.9x}	0.3	X	2.4	4	x	1	18.15]	0.63	X	0.7	=	33.76	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	1	13.91		0.63	X	0.7	=	32.55	(79)
Southwest _{0.9x}	0.3	X	2.4	4	x	10	04.39		0.63	X	0.7	=	29.83	(79)
Southwest _{0.9x}	0.3	x	2.4	4	x	9	2.85		0.63	x	0.7	=	26.53	(79)
Southwest _{0.9x}	0.3	X	2.4	4	x	6	9.27		0.63	x	0.7	=	19.79	(79)
Southwest _{0.9x}	0.3	х	2.4	4	X	4	4.07		0.63	Х	0.7	=	12.59	(79)
Southwest _{0.9x}	0.3	x	2.4	4	x	3	1.49	i	0.63	Х	0.7	_	9	(79)
West 0.9x	0.3	x	2.6	5	x	1	9.64	x	0.63	X	0.7	=	6.08	(80)
West 0.9x	0.3	x	2.6	6	x	3	8.42	x	0.63	X	0.7	=	11.89	(80)
West 0.9x	0.3	x	2.6	5	X	6	3.27	Х	0.63	x	0.7	<u> </u>	19.59	(80)
West 0.9x	0.3	X	2.0	5	X	9	2.28	X	0.63	X	0.7	-	28.57	(80)
West 0.9x	0.3	X	2.0	3	х	1/	13.09	X	0.63	x	0.7		35.01	(80)
West 0.9x	0.3	X	2.0	3	x	1	15.77	X	0.63	×	0.7		35.84	(80)
West 0.9x	0.3	X	2.0	3	x	1	10.22	X	0.63	x	0.7	=	34.12	(80)
West 0.9x	0.3	X	2.0	3	x	9	4.68	X	0.63	x	0.7	=	29.31	(80)
West 0.9x	0.3	X	2.0	3	x	7	3.59	X	0.63	x	0.7	=	22.78	(80)
West 0.9x	0.3	X	2.0		x		5.59	X	0.63	x	0.7	=	14.11	(80)
West 0.9x	0.3	X	2.0	5	x	_	4.49	X	0.63	x	0.7		7.58	(80)
West 0.9x	0.3	X	2.0		x		6.15	X	0.63	×	0.7			(80)
L								J						
Solar gains in v	vatts, ca	alculated	I for eacl	n mont	h			(83)m	= Sum(74)n	n(82)r	n			
(83)m= 31.07	53.51	74.29	93.06	104.58	$\overline{}$	03.83	100.11	91.	61 80.86	59.4	8 37.33	26.5		(83)
Total gains – in	ternal a	nd solar	(84)m =	(73)m	+ (83)m	, watts		•	•	•	•	_	
(84)m= 355.36	376.03	386.82	389.65	385.28	3	69.03	355.15	351	.59 348.94	4 343.	339.98	342.72		(84)
7. Mean intern	al temp	erature	(heating	seaso	n)									
Temperature of			`			area 1	rom Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fact	or for ga	ains for	living are	ea, h1,r	n (s	ee Ta	ble 9a)							
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	A	ug Sep	00	t Nov	Dec		
(86)m= 1	0.99	0.99	0.98	0.95	+	0.85	0.69	0.7	-	0.98	0.99	1		(86)
Mean internal	temper	ature in	living ar		follo	w ste	ns 3 to 7	7 in T	able 9c)		<u> </u>		<u></u>	
(87)m= 19.79	19.89	20.09	20.37	20.64	_	20.87	20.97	20.		20.4	7 20.09	19.77		(87)
			<u> </u>										_	

Tomporatura duri	a booting r	aariada ir	root of	duallina	from To	bla O T	ha (°C\					
Temperature durir (88)m= 19.93 19.93	 	19.95	19.95	19.96	19.96	19.96	<u> </u>	19.95	19.95	19.94		(88)
` '		ļ.		<u> </u>		ļ	19.96	19.95	19.95	19.94		(00)
Utilisation factor for (89) m= 1 0.9	-	0.97	welling, 0.92	n2,m (se	0.55	9a) 0.58	0.84	0.97	0.99	1		(89)
· · L		!		<u> </u>		<u> </u>	<u> </u>	<u> </u>	0.00	'		()
Mean internal tem (90)m= 18.33 18.	1	19.18	of dwelli 19.57	ng 12 (f	19.95	19.94	7 IN Tabl	e 9c) 19.34	18.78	18.31		(90)
10.00	0 10.77	10.10	10.07	10.07	10.00	10.04	<u> </u>	!	g area ÷ (4		0.56	(91)
				\		<i>(</i>			`	′ l	0.00	(0.)
Mean internal tem (92)m= 19.15 19.1	`	1			1		<u> </u>	40.07	40.54	40.40		(92)
(92)m= 19.15 19.3 Apply adjustment		19.85	20.17	20.43	20.52	20.51	20.37	19.97	19.51	19.13		(92)
(93)m= 19.15 19.1		19.85	20.17	20.43	20.52	20.51	20.37	19.97	19.51	19.13		(93)
8. Space heating			20111	20110	20.02	20.01	20.01	10.01	10.01	101.10		(11)
Set Ti to the mear	·		re obtain	ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation factor	r for gains	using Ta	ble 9a			ī						
Jan Fe		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor fo	-	1										(0.4)
(94)m= 0.99 0.9		0.97	0.93	0.81	0.63	0.66	0.86	0.97	0.99	1		(94)
Useful gains, hm (95)m= 353.25 372		4)m x (84 377.74	4)m 357	298.67	223.52	231.67	301.29	331.87	336.37	341.02		(95)
Monthly average					223.32	231.07	301.29	331.07	330.37	341.02		(00)
(96)m= 4.3 4.9		8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for												, ,
(97)m= 915.09 883		662.82	511.85	348.45	234.22	245.32	376.26	566.24	753.44	910.67		(97)
Space heating rec	uirement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m			
(98)m= 418.01 343	32 310	205.26	115.21	0	0	0	0	174.37	300.3	423.82		
				-		Tota	l per year	(kWh/year	·) = Sum(9	8) _{15,912} =	2290.29	(98)
Space heating red	uirement ir	n kWh/m²	/year								44.04	(99)
9a. Energy require	nents – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)			ı		
Space heating:							,					
Fraction of space	neat from s	econdar	y/supple	mentary	system						0	(201)
Fraction of space	neat from r	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of total he	ating from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		Ī	1	(204)
Efficiency of main	space hea	ting syste	em 1							Ī	93.5	(206)
Efficiency of secon	dary/supp	lementar	y heating	g systen	า, %					Ì	0	(208)
Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	- ear
Space heating red		<u> </u>		L	!		<u>'</u>	ļ.	<u>I</u>		,	
418.01 343	32 310	205.26	115.21	0	0	0	0	174.37	300.3	423.82		
(211) m = {[(98)m x	(204)] } x	100 ÷ (20	06)	_								(211)
447.07 367	18 331.55	219.53	123.22	0	0	0	0	186.5	321.17	453.29		
	•			•		Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	2449.51	(211)
Space heating fue	(seconda	ry), kWh/	month							•		_
= {[(98)m x (201)] }		T .		ı		ı	1	ı	ı			
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		_
						1018	ıl (kWh/yea	ar) =5um(2	د انگا _{15,1012}	F	0	(215)

25.59 121.18	132.19	131.71	147.54	155.28	166.25		
!	1	l	l	<u> </u>	l	79.8	(216)
79.8 79.8	79.8	79.8	85.26	86.54	87.21		(217)
•						•	
57.38 151.86	165.65	165.05	173.04	179.42	190.64		
	Tota	I I = Sum(2	19a) ₁₁₂ =			2065.42	(219)
			k\	Wh/year	•	kWh/yea	
						2449.51	
						2065.42	
					30		(230
					45		(230
	sum	of (230a).	(230g) =			75	(231)
						252.67	(232)
s including m	icro-CHF						
Energy			Emiss	ion fac	tor	Emissions	•
(211) x			0.2	16	=	529.09	(261)
(215) x			0.5	19	=	0	(263)
(219) x			0.2	16	=	446.13	(264)
(261) + (262)	+ (263) + ((264) =				975.23	(265)
(231) x			0.5	19	=	38.93	(267)
(232) x			0.5	19	=	131.14	(268)
	79.8 79.8 57.38 151.86 57.38 151.86 Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	79.8 79.8 79.8 57.38 151.86 165.65 Tota sum s including micro-CHF Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (263) + (261) x	79.8 79.8 79.8 79.8 57.38 151.86 165.65 165.05 Total = Sum(2 sum of (230a). s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	79.8 79.8 79.8 79.8 85.26 57.38 151.86 165.65 165.05 173.04 Total = Sum(219a) ₁₁₂ = k1 sum of (230a)(230g) = s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x (263) x (263) x (264) x (265) x (265) x (266)	79.8 79.8 79.8 79.8 85.26 86.54 57.38 151.86 165.65 165.05 173.04 179.42 Total = Sum(219a) ₁₁₂ = kWh/year s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x 0.519	79.8 79.8 79.8 79.8 85.26 86.54 87.21 57.38 151.86 165.65 165.05 173.04 179.42 190.64 Total = Sum(219a),2 = kWh/year 30 45 sum of (230a)(230g) = s including micro-CHP Energy kWh/year (211) x (211) x (215) x (219) x (219) x (261) + (262) + (263) + (264) = (231) x (231) x (231) x (262) + (263) + (264) = (231) x (263) + (264) = (231) x	79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.9 75.23 75.23 75.23 76.20 77.20 77.20 77.20 77.20 77.20 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.

TER =

22.02

(273)

					User D	etails:						
Assessor Name:						Strom	a Num	ber:				
Software Name:	Stron	na FS/	AP 201	2		Softwa	are Ve	rsion:		Versio	n: 1.0.4.26	
				Р	roperty .	Address	: C84_B	e Green				
Address :												
1. Overall dwelling dime	ensions:				A	- (2)		A 11-	'asla (/ssa)		Malana a fast	2)
Ground floor						22.5	(1a) x		ight(m) 2.8	(2a) =	Volume(m ³	3) (3a
	a) ı (1h) ı	. (10) . (1	1 d) . /1 o)					2.0	(2u) -	343	(ou
Total floor area TFA = (1	a)+(1b)+	+(10)+(ra)+(re)+(11	1)1	22.5	(4)					_
Dwelling volume							(3a)+(3b)+(3c)+(3d	d)+(3e)+	.(3n) =	343	(5)
2. Ventilation rate:								4-4-1				
		ain ating		econdar eating	у 	other	_	total			m³ per hou	ır —
Number of chimneys		0	+	0	+	0	=	0	X 4	40 =	0	(6a
Number of open flues		0	+	0] + [0	= [0	x 2	20 =	0	(6b
Number of intermittent fa	ans		_					0	x	10 =	0	(7a
Number of passive vents	3						Ī	0	x -	10 =	0	(7b
Number of flueless gas f	ires						F	0	X 4	40 =	0	(7c
							L					
										Air ch	nanges <mark>per</mark> ho	our
Infilt <mark>ration</mark> due to chi <mark>mne</mark>	ys, flues	and fa	ns = (6	a)+(6b)+(7	7a)+(7b)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has t				ed, procee	d to (17), o	otherwise (continue fr	rom (9) to ((16)			_
Number of storeys in t Additional infiltration	he dw <mark>ell</mark> i	ing (ns)							[(0)	410.4	0	(9)
Structural infiltration: 0) 25 for s	steel or	timber t	frame or	0 35 for	r masoni	ry consti	ruction	[(9)	-1]x0.1 =	0	(10
if both types of wall are p							•	dollon			0	(
deducting areas of openi	• / .			1) 0	4 / 1	15 1						_
If suspended wooden			•	ed) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, en Percentage of window	•	•		rinned							0	(13
Window infiltration	3 and ac	JO13 G16	agrit st	пррси		0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate						(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16
Air permeability value,	q50, exp	pressed	d in cub	ic metre	s per ho	our per s	quare m	etre of e	envelope	area	3	(17
lf based on air permeabi	lity value	e, then	(18) = [(1	7) ÷ 20]+(8), otherwi	ise (18) = (16)				0.15	(18
Air permeability value applie		ssurisatio	n test has	s been dor	ne or a deg	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed					(20) = 1 -	[0.075 x (1	19)1 =			2	(19
Infiltration rate incorpora	tina shel	lter fact	or			(21) = (18		.0/] —			0.85	(20
Infiltration rate modified	•			I		,, (10	, (==)				0.13	(21
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp					I	1		1 - 5.	1	1 - 55	I	
(22)m= 5.1 5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
· · <u> </u>				<u> </u>	I	I		ı	ı	I	I	
Wind Factor (22a)m = (2	2)m ÷ 4										•	
(22a)m= 1.27 1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rate	e (allowi	ing for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		-	rate for t	he appli	cable ca	se					•		
If exhaust air h			andiv N (2	13h) - (23	a) v Emy (4	aguation (I	NSN other	nvice (23h) = (232)			0.5	(23a
If balanced with) = (23a)			0.5	(23b
		-	-	_					2b\m . /′	22h) [1 (220)	76.5	(230
a) If balance (24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	+ 100j	(24a
b) If balance	ļ	ļ	Į	<u> </u>	Į	<u> </u>	ļ		ļ ļ		0.21		(= :-
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h		tract ver		or nositiv		ventilatio	n from c	utsida					,
,				•	•				5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural	ventilatio	on or wh	ole hous	se positi	ve input	ventilatio	on from I	oft				•	
if (22b)r	n = 1, the	en (24d)	m = (221)	b)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			Ī	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air			`	í `	ŕ	``	· ·	<u> </u>				İ	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and he	eat loss	parai <mark>net</mark>	er:									
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/k	<)	k-value kJ/m²-l		A X k kJ/K
Doo <mark>rs Ty</mark> pe 1					2.1	x	1.3	= [2.73				(26)
Doo <mark>rs Ty</mark> pe 2					4	x	1.3] =	5.2				(26)
Doors Type 3					2.3	x	1	_ =	2.3	Ī			(26)
Windows Type	e 1				3.2	x1	/[1/(1.3)+	0.04] =	3.95	5			(27)
Windows Type	e 2				1.9	x1	/[1/(1.3)+	0.04] =	2.35				(27)
Windows Type	e 3				4.3	x1	/[1/(1.3)+	0.04] =	5.31				(27)
Windows Type	e 4				4	x1	/[1/(1.3)+	0.04] =	4.94				(27)
Windows Type	e 5				3.3	x1	/[1/(1.3)+	0.04] =	4.08				(27)
Windows Type	e 6				3.3	x1	/[1/(1.3)+	0.04] =	4.08				(27)
Windows Type	e 7				1.3	x1	/[1/(1.3)+	0.04] =	1.61				(27)
Floor					122.5	x	0.1		12.25	=		–	(28)
Walls	78.9	06	29.7	,	49.26	=	0.15	=	7.39	=		-	(29)
Total area of e					201.4	=							(31)
* for windows and ** include the area	l roof wind	ows, use e			alue calcul		g formula 1.	/[(1/U-valu	ıe)+0.04] a	s given in	n paragraph	3.2	` '
Fabric heat los				•			(26)(30)	+ (32) =				56.19	(33)
			-					((20)	(20) + (22))	(2.2.)		
Heat capacity		(Axk)						((20)	(30) + (32	(32a)	(32e) =	22834.	4 (34)
Heat capacity Thermal mass	Cm = S(,	⊃ = Cm -	: TFA) ir	n kJ/m²K				tive Value:	, , ,	(32e) =		
Thermal mass	Cm = S(parame sments wh	ter (TMI ere the de	tails of the	•			ecisely the	Indica	tive Value:	Medium		22834. 250	(34)
Thermal mass	Cm = S(parame sments wh	ter (TMF ere the de tailed calc	etails of the ulation.	construct	ion are no	t known pi	recisely the	Indica	tive Value:	Medium			

if details of therma	0 0	are not kn	own (36) =	= 0.05 x (3	1)			(22)	(26)		Γ		
Total fabric he Ventilation hea		alculatos	l monthly	,				(33) +	` '	25)m x (5)	L	66.26	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 31.7	31.34	30.98	29.17	28.81	27.01	27.01	26.65	27.73	28.81	29.54	30.26		(38)
Heat transfer of									= (37) + (37)	<u> </u>			, ,
(39)m= 97.96	97.6	97.24	95.43	95.07	93.27	93.27	92.91	93.99	95.07	95.8	96.52		
` '	ļ				ļ		l	,	Average =	Sum(39) ₁	12 /12=	95.34	(39)
Heat loss para	meter (H	HLP), W	m²K					(40)m	= (39)m ÷	(4)			
(40)m= 0.8	0.8	0.79	0.78	0.78	0.76	0.76	0.76	0.77	0.78	0.78	0.79		_
Number of day	/s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.78	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	I				l	l	l						
4. Water hea	ting ener	av requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)1 + 0.()013 x (1	ΓFA -13.		.87		(42)
if TFA £ 13.9			i ovb	(0.0000) 10 X (11	71 10.0	/_/]	70 10 X (· ·			
Annual averag									- 4		2.42		(43)
Redu <mark>ce the</mark> annua not m <mark>ore tha</mark> t 125	_				_	-	o acnieve	a water us	e target o	I			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								ООР	001	1101	D 00		
(44)m= 112.66	108.57	104.47	100.37	96.28	92.18	92.18	96.28	100.37	104.47	108.57	112.66		
							ı			m(44) ₁₁₂ =	L	1229.06	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mon	th (see Ta	ables 1b, 1	(c, 1d)		
(45)m= 167.08	146.13	150.79	131.46	126.14	108.85	100.87	115.74	117.13	136.5	149	161.8		_
lf instantaneous v	vater heatii	na at point	of use (no	hot water	r storage).	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	= [1611.49	(45)
(46)m= 25.06	21.92	22.62	19.72	18.92	16.33	15.13	17.36	17.57	20.48	22.35	24.27		(46)
Water storage		22.02	19.72	10.92	10.33	13.13	17.30	17.57	20.40	22.33	24.27		(40)
Storage volum	ne (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		oclared l	oss facto	or ie kno	wn (k\\/k	2/d2v/):					00		(40)
Temperature f				טווא כו וכ	wii (Kvvi	i/uay).					.63		(48)
•				oor			(49) v (40)				0.6		(49)
Energy lost fro b) If manufact		•	-		or is not	known:	(48) x (49)	=		0.	.98		(50)
Hot water stor			-								0		(51)
If community h	•		on 4.3										
	trom Tal	ble 2a									0		(52)
	actor fro	m Tabla	2h								$\overline{}$		/FO\
Volume factor Temperature f							(47) (5.0)	··· (EQ)	-0)		0		
	m water	storage		ear			(47) x (51)	x (52) x (53) =		0 0 .98		(53) (54) (55)

Water storage loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m= 30.32 27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(56)
If cylinder contains dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m= 30.32 27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(57)
Primary circuit loss (ar	nual) fro	om Table	3							0		(58)
Primary circuit loss cal	,			59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified by factor f	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)		_	
(59)m= 23.26 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required for	water h	eating ca	alculated	I for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 220.66 194.52	204.37	183.31	179.72	160.7	154.45	169.32	168.98	190.08	200.85	215.39		(62)
Solar DHW input calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	•	
(add additional lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)				_	
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water hea	ter											
(64)m= 220.66 194.52	204.37	183.31	179.72	160.7	154.45	169.32	168.98	190.08	200.85	215.39		_
						Outp	out from wa	ater heate	r (annual)	12	2242.35	(64)
Heat gains from water	heating,	kWh/m	onth 0.2	5 [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m]	
(05) 00.40 07.0	00	05.40	04.04	77.07						00.00	1	(65)
(65)m= 98.42 87.3	93	85.19	84.81	<mark>7</mark> 7.67	76.4	81.35	80.43	88.25	91.02	96.66		(00)
include (57)m in calc				_							 neating	(00)
` ' -	culation	of (65)m	only if c	_							eating	(00)
include (57)m in cald	culation of Table 5	of (65)m	only if c	_							neating	(00)
include (57)m in calc 5. Internal gains (see	culation of Table 5	of (65)m	only if c	_							neating	(00)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table	culation of Table 5	of (65)m and 5a	only if c	ylinder i	s in the d	dwelling	or hot w	ater is fr	om com	munity h	neating	(66)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb	Table 5 5), Wat Mar	of (65)m 5 and 5a ts Apr 143.62	only if controls: May 143.62	Jun 143.62	Jul 143.62	Aug 143.62	Sep 143.62	ater is fr	om com	munity h	neating	
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62	Table 5 5), Wat Mar	of (65)m 5 and 5a ts Apr 143.62	only if controls: May 143.62	Jun 143.62	Jul 143.62	Aug 143.62	Sep 143.62	ater is fr	om com	munity h	neating	
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula	Table 5 Table 5 Table 5 Mar 143.62 ted in Ap 18.57	of (65)m 5 and 5a tts Apr 143.62 opendix 14.06	only if constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the consta	Jun 143.62 ion L9 o	Jul 143.62 r L9a), a	Aug 143.62 Iso see	Sep 143.62 Table 5	Oct 143.62	Nov	Dec	neating	(66)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84	Table 5 Table 5 Table 5 Mar 143.62 ted in Ap 18.57	of (65)m 5 and 5a tts Apr 143.62 opendix 14.06	only if constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the constant in the consta	Jun 143.62 ion L9 o	Jul 143.62 r L9a), a	Aug 143.62 Iso see	Sep 143.62 Table 5	Oct 143.62	Nov	Dec	neating	(66)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula	Table 5 5), Wat Mar 143.62 ted in Ap 18.57 culated in	of (65)m 5 and 5a ts Apr 143.62 opendix 14.06 Appendix 267.83	May 143.62 L, equati 10.51 dix L, eq 247.56	Jun 143.62 ion L9 o 8.87 uation L 228.51	Jul 143.62 r L9a), a 9.59 13 or L1: 215.78	Aug 143.62 Iso see 12.46 3a), also	Sep 143.62 Table 5 16.73 see Ta 220.33	Oct 143.62 21.24 ble 5 236.39	Nov 143.62 24.79	Dec 143.62	neating	(66) (67)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula (68)m= 288.43 291.43	Table 5 5), Wat Mar 143.62 ted in Ap 18.57 culated in	of (65)m 5 and 5a ts Apr 143.62 opendix 14.06 Appendix 267.83	May 143.62 L, equati 10.51 dix L, eq 247.56	Jun 143.62 ion L9 o 8.87 uation L 228.51	Jul 143.62 r L9a), a 9.59 13 or L1: 215.78	Aug 143.62 Iso see 12.46 3a), also	Sep 143.62 Table 5 16.73 see Ta 220.33	Oct 143.62 21.24 ble 5 236.39	Nov 143.62 24.79	Dec 143.62	neating	(66) (67)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula (68)m= 288.43 291.43 Cooking gains (calcula	ted in Apulated in	of (65)m 5 and 5a ts Apr 143.62 opendix 14.06 n Append 267.83 opendix 37.36	May 143.62 L, equati 10.51 dix L, equate 247.56 L, equate	Jun 143.62 ion L9 o 8.87 uation L 228.51	Jul 143.62 r L9a), a 9.59 13 or L1: 215.78 or L15a)	Aug 143.62 Iso see 12.46 3a), also 212.79	Sep 143.62 Table 5 16.73 see Ta 220.33	Oct 143.62 21.24 ble 5 236.39 5	Nov 143.62 24.79	Dec 143.62 26.43	neating	(66) (67) (68)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula (68)m= 288.43 291.43 Cooking gains (calcula (69)m= 37.36 37.36	ted in Apulated in	of (65)m 5 and 5a ts Apr 143.62 opendix 14.06 n Append 267.83 opendix 37.36	May 143.62 L, equati 10.51 dix L, equate 247.56 L, equate	Jun 143.62 ion L9 o 8.87 uation L 228.51	Jul 143.62 r L9a), a 9.59 13 or L1: 215.78 or L15a)	Aug 143.62 Iso see 12.46 3a), also 212.79	Sep 143.62 Table 5 16.73 see Ta 220.33	Oct 143.62 21.24 ble 5 236.39 5	Nov 143.62 24.79	Dec 143.62 26.43	leating	(66) (67) (68)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula (68)m= 288.43 291.43 Cooking gains (calcula (69)m= 37.36 37.36 Pumps and fans gains	ted in Aparted in Apar	of (65)m 5 and 5a ts Apr 143.62 ppendix 14.06 Appendix 267.83 ppendix 37.36 5a) 0	only if control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of th	Jun 143.62 ion L9 o 8.87 uation L 228.51 ion L15 37.36	Jul 143.62 r L9a), a 9.59 13 or L1: 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36	Sep 143.62 Table 5 16.73 see Ta 220.33 ee Table 37.36	Oct 143.62 21.24 ble 5 236.39 5 37.36	Nov 143.62 24.79 256.66	Dec 143.62 26.43 275.71 37.36	neating	(66) (67) (68) (69)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula (68)m= 288.43 291.43 Cooking gains (calcula (69)m= 37.36 37.36 Pumps and fans gains (70)m= 0 0	ted in Aparted in Apar	of (65)m 5 and 5a ts Apr 143.62 ppendix 14.06 Appendix 267.83 ppendix 37.36 5a) 0	only if control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of th	Jun 143.62 ion L9 o 8.87 uation L 228.51 ion L15 37.36	Jul 143.62 r L9a), a 9.59 13 or L1: 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36	Sep 143.62 Table 5 16.73 see Ta 220.33 ee Table 37.36	Oct 143.62 21.24 ble 5 236.39 5 37.36	Nov 143.62 24.79 256.66	Dec 143.62 26.43 275.71 37.36	neating	(66) (67) (68) (69)
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include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula (68)m= 288.43 291.43 Cooking gains (calcula (69)m= 37.36 37.36 Pumps and fans gains (70)m= 0 0 Losses e.g. evaporatio (71)m= -114.9 -114.9	ted in Apart 283.88 ated in Ap	of (65)m 5 and 5a ts Apr 143.62 ppendix 14.06 Append 267.83 ppendix 37.36 5a) 0 tive valu	only if co May 143.62 L, equati 10.51 dix L, equati 247.56 L, equati 37.36	Jun 143.62 ion L9 o 8.87 uation L 228.51 ion L15 37.36	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36	Sep 143.62 Table 5 16.73 see Ta 220.33 ee Table 37.36	Oct 143.62 21.24 ble 5 236.39 5 37.36	Nov 143.62 24.79 256.66	Dec 143.62 26.43 275.71 37.36	heating	(66) (67) (68) (69) (70)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula (68)m= 288.43 291.43 Cooking gains (calcula (69)m= 37.36 37.36 Pumps and fans gains (70)m= 0 0 Losses e.g. evaporatio (71)m= -114.9 -114.9 Water heating gains (7	ted in April 18.57 culated in April 283.88 ated in	of (65)m 5 and 5a ts Apr 143.62 ppendix 14.06 Appendix 37.36 5a) 0 tive valu -114.9	only if construction in the construction is constructed as the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the con	Jun 143.62 ion L9 o 8.87 uation L 228.51 iion L15 37.36 0 lle 5) -114.9	Jul 143.62 r L9a), a 9.59 13 or L1: 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36 0	Sep 143.62 Table 5 16.73 see Ta 220.33 ee Table 37.36 0	Oct 143.62 21.24 ble 5 236.39 5 37.36 0 -114.9	Nov 143.62 24.79 256.66 37.36 0	Dec 143.62 26.43 275.71 37.36 0	neating	(66) (67) (68) (69) (70)
include (57)m in calc 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 143.62 143.62 Lighting gains (calcula (67)m= 25.71 22.84 Appliances gains (calcula (68)m= 288.43 291.43 Cooking gains (calcula (69)m= 37.36 37.36 Pumps and fans gains (70)m= 0 0 Losses e.g. evaporatio (71)m= -114.9 -114.9 Water heating gains (72)m= 132.28 129.92	ted in April 18.57 culated in April 283.88 ated in	of (65)m 5 and 5a ts Apr 143.62 ppendix 14.06 Appendix 37.36 5a) 0 tive valu -114.9	only if construction in the construction is constructed as the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the construction in the con	Jun 143.62 ion L9 o 8.87 uation L 228.51 iion L15 37.36 0 lle 5) -114.9	Jul 143.62 r L9a), a 9.59 13 or L1 215.78 or L15a) 37.36	Aug 143.62 Iso see 12.46 3a), also 212.79 , also se 37.36 0	Sep 143.62 Table 5 16.73 see Ta 220.33 ee Table 37.36 0	Oct 143.62 21.24 ble 5 236.39 5 37.36 0 -114.9	Nov 143.62 24.79 256.66 37.36 0	Dec 143.62 26.43 275.71 37.36 0	neating	(66) (67) (68) (69) (70)

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

Orienta	tion:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	3.2	x	10.63	x	0.53	x	0.7	=	8.75	(74)
North	0.9x	0.77	х	1.9	x	10.63	x	0.53	х	0.7	=	5.19	(74)
North	0.9x	0.77	х	4.3	x	10.63	x	0.53	х	0.7	=	11.76	(74)
North	0.9x	0.77	x	4	x	10.63	x	0.53	x	0.7] =	10.94	(74)
North	0.9x	0.77	х	3.3	x	10.63	x	0.53	х	0.7	=	9.02	(74)
North	0.9x	0.77	x	3.3	x	10.63	x	0.53	х	0.7	=	9.02	(74)
North	0.9x	0.77	x	1.3	x	10.63	x	0.53	х	0.7	=	3.55	(74)
North	0.9x	0.77	x	3.2	x	20.32	x	0.53	x	0.7	=	16.72	(74)
North	0.9x	0.77	x	1.9	x	20.32	x	0.53	х	0.7	=	9.93	(74)
North	0.9x	0.77	x	4.3	x	20.32	x	0.53	x	0.7	=	22.47	(74)
North	0.9x	0.77	x	4	x	20.32	x	0.53	x	0.7	=	20.9	(74)
North	0.9x	0.77	x	3.3	x	20.32	x	0.53	x	0.7	=	17.24	(74)
North	0.9x	0.77	x	3.3	x	20.32	x	0.53	x	0.7	=	17.24	(74)
North	0.9x	0.77	x	1.3	x	20.32	x	0.53	x	0.7	=	6.79	(74)
North	0.9x	0.77	x	3.2	x	34.53	x	0.53	x	0.7	=	28.41	(74)
North	0.9x	0.77	X	1.9	X	34.53	X	0.53	X	0.7] =	16.87	(74)
North	0.9x	0.77	x	4.3	x	34.53	x	0.53	x	0.7		38.17	(74)
North	0.9x	0.77	x	4	х	34.53] x	0.53	x	0.7	=	35.51	(74)
North	0.9x	0.77	x	3.3	x	34.53	x	0.53	x	0.7	=	29.3	(74)
North	0.9x	0.77	x	3.3	x	34.53	х	0.53	x	0.7	=	29.3	(74)
North	0.9x	0.77	x	1.3	x	34.53	×	0.53	x	0.7	=	11.54	(74)
North	0.9x	0.77	x	3.2	x	55.46	x	0.53	x	0.7	=	45.63	(74)
North	0.9x	0.77	x	1.9	X	55.46	X	0.53	X	0.7	=	27.09	(74)
North	0.9x	0.77	x	4.3	X	55.46	X	0.53	X	0.7	=	61.32	(74)
North	0.9x	0.77	x	4	X	55.46	X	0.53	x	0.7	=	57.04	(74)
North	0.9x	0.77	x	3.3	x	55.46	x	0.53	X	0.7	=	47.06	(74)
North	0.9x	0.77	x	3.3	x	55.46	x	0.53	x	0.7	=	47.06	(74)
North	0.9x	0.77	x	1.3	X	55.46	x	0.53	X	0.7	=	18.54	(74)
North	0.9x	0.77	x	3.2	X	74.72	X	0.53	X	0.7	=	61.47	(74)
North	0.9x	0.77	x	1.9	X	74.72	x	0.53	X	0.7	=	36.5	(74)
North	0.9x	0.77	x	4.3	X	74.72	x	0.53	X	0.7	=	82.6	(74)
North	0.9x	0.77	x	4	x	74.72	x	0.53	x	0.7	=	76.84	(74)
North	0.9x	0.77	x	3.3	x	74.72	x	0.53	X	0.7	=	63.39	(74)
North	0.9x	0.77	x	3.3	x	74.72	x	0.53	X	0.7	=	63.39	(74)
North	0.9x	0.77	x	1.3	x	74.72	x	0.53	x	0.7	=	24.97	(74)
North	0.9x	0.77	x	3.2	x	79.99	x	0.53	x	0.7	=	65.81	(74)
North	0.9x	0.77	x	1.9	x	79.99	x	0.53	x	0.7	=	39.07	(74)
North	0.9x	0.77	x	4.3	x	79.99	x	0.53	x	0.7	=	88.43	(74)
North	0.9x	0.77	X	4	X	79.99	×	0.53	X	0.7	=	82.26	(74)

	_		,						ı				_
North	0.9x	0.77	X	3.3	X	79.99	X	0.53	X	0.7	=	67.86	(74)
North	0.9x	0.77	X	3.3	X	79.99	X	0.53	X	0.7	=	67.86	(74)
North	0.9x	0.77	X	1.3	X	79.99	x	0.53	X	0.7	=	26.73	(74)
North	0.9x	0.77	X	3.2	X	74.68	X	0.53	X	0.7	=	61.44	(74)
North	0.9x	0.77	X	1.9	X	74.68	x	0.53	X	0.7	=	36.48	(74)
North	0.9x	0.77	X	4.3	X	74.68	x	0.53	X	0.7	=	82.56	(74)
North	0.9x	0.77	X	4	x	74.68	x	0.53	X	0.7	=	76.8	(74)
North	0.9x	0.77	x	3.3	x	74.68	x	0.53	x	0.7	=	63.36	(74)
North	0.9x	0.77	x	3.3	x	74.68	x	0.53	x	0.7	=	63.36	(74)
North	0.9x	0.77	x	1.3	x	74.68	x	0.53	x	0.7	=	24.96	(74)
North	0.9x	0.77	x	3.2	x	59.25	x	0.53	x	0.7	=	48.74	(74)
North	0.9x	0.77	x	1.9	x	59.25	x	0.53	x	0.7	=	28.94	(74)
North	0.9x	0.77	x	4.3	x	59.25	x	0.53	x	0.7	=	65.5	(74)
North	0.9x	0.77	x	4	x	59.25	x	0.53	x	0.7	=	60.93	(74)
North	0.9x	0.77	x	3.3	x	59.25	x	0.53	x	0.7	=	50.27	(74)
North	0.9x	0.77	X	3.3	x	59.25	x	0.53	x	0.7	=	50.27	(74)
North	0.9x	0.77	X	1.3	x	59.25	x	0.53	x	0.7	=	19.8	(74)
North	0.9x	0.77	X	3.2	X	41.52	Х	0.53	X	0.7	=	34.16	(74)
North	0.9x	0.77	x	1.9	x	41.52	x	0.53	x	0.7	=	20.28	(74)
North	0.9x	0.77	x	4.3	х	41.52] x	0.53	x	0.7	=	45.9	(74)
North	0.9x	0.77	x	4	X	41.52	x	0.53	x	0.7	=	42.7	(74)
North	0.9x	0.77	x	3.3	x	41.52	Х	0.53	x	0.7	=	35.22	(74)
North	0.9x	0.77	x	3.3	x	41.52	X	0.53	x	0.7	=	35.22	(74)
North	0.9x	0.77	X	1.3	х	41.52	x	0.53	X	0.7	=	13.88	(74)
North	0.9x	0.77	X	3.2	X	24.19	X	0.53	X	0.7	=	19.9	(74)
North	0.9x	0.77	X	1.9	X	24.19	x	0.53	X	0.7	=	11.82	(74)
North	0.9x	0.77	X	4.3	X	24.19	X	0.53	x	0.7	=	26.74	(74)
North	0.9x	0.77	X	4	X	24.19	x	0.53	X	0.7	=	24.88	(74)
North	0.9x	0.77	X	3.3	X	24.19	X	0.53	X	0.7	=	20.52	(74)
North	0.9x	0.77	X	3.3	x	24.19	X	0.53	x	0.7	=	20.52	(74)
North	0.9x	0.77	X	1.3	x	24.19	x	0.53	X	0.7	=	8.08	(74)
North	0.9x	0.77	X	3.2	X	13.12	x	0.53	X	0.7	=	10.79	(74)
North	0.9x	0.77	X	1.9	x	13.12	x	0.53	x	0.7	=	6.41	(74)
North	0.9x	0.77	X	4.3	x	13.12	x	0.53	x	0.7	=	14.5	(74)
North	0.9x	0.77	X	4	X	13.12	X	0.53	X	0.7	=	13.49	(74)
North	0.9x	0.77	x	3.3	x	13.12	x	0.53	x	0.7	=	11.13	(74)
North	0.9x	0.77	x	3.3	x	13.12	x	0.53	x	0.7	=	11.13	(74)
North	0.9x	0.77	x	1.3	x	13.12	x	0.53	x	0.7	=	4.38	(74)
North	0.9x	0.77	x	3.2	x	8.86	x	0.53	x	0.7	=	7.29	(74)
North	0.9x	0.77	x	1.9	x	8.86	x	0.53	X	0.7	=	4.33	(74)
North	0.9x	0.77	X	4.3	×	8.86	x	0.53	X	0.7	=	9.8	(74)

North	0.9x	0.77	x	4		x	8.86		х	0.53	x	0.7		9.12	(74)
North	0.9x	0.77	x	3.3	3	x	8.86		x	0.53	x	0.7	=	7.52	(74)
North	0.9x	0.77	Х	3.3	3	x	8.86		x	0.53	x	0.7	=	7.52	(74)
North	0.9x	0.77	x	1.3	3	x T	8.86		х	0.53	_ x [0.7		2.96	(74)
	_					_									
Solar ga	ains in	watts, ca	alculated	l for eacl	h month				(83)m = S	Sum(74)m .	(82)m				
(83)m=	58.23	111.28	189.1	303.74	409.17	438	3.02 408	3.95	324.45	227.36	132.47	71.84	48.54		(83)
Total ga	ains – ir	nternal a	nd solar	(84)m =	(73)m -	+ (8:	3)m , wa	tts		•		•	•	•	
(84)m=	570.75	621.55	682.64	770.04	847.31	849	9.37 803	3.1	725.13	642.21	574.8	545.79	546.69		(84)
7. Mea	an inter	nal temp	erature	(heating	season)									
							rea from	Tab	ole 9 Th	1 (°C)				21	(85)
•		_	•			-	e Table 9		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	()					(,
Г	Jan	Feb	Mar	Apr	May	Ò.		ul	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	1	1	1	0.98	0.89	_	68 0.5	_	0.58	0.88	0.99	1	1		(86)
` ' L										ļ	0.00			l	()
Г							v steps 3					ı		1	(a=)
(87)m=	20.13	20.22	20.4	20.67	20.89	20	.99 2	1	21	20.93	20.65	20.35	20.12		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dwe	elling fron	n Ta	ble 9, T	h2 (°C)				_	
(88)m=	20.25	20.26	20.26	20.27	20.27	20	.29 20.	.29	20.29	20.28	20.27	20.27	20.26		(88)
Utilisat	tion fac	tor for g	ains for I	rest of d	welling.	h2,n	n (see Ta	able	9a)						
(89)m=	1	1	1	0.97	0.86		62 0.4		0.5	0.83	0.99	1	1		(89)
Moan	intorna	tompor	ature in	the rest	of dwalli	ng 7	Γ2 (follov	v sto	ne 3 to	7 in Tabl	0.90)			1	
(90)m=	19.06	19.2	19.47	19.87	20.17	Ť	.28 20.		20.29	20.22	19.85	19.41	19.06]	(90)
(00)	.0.00	.0.2	,,,,,,	10101			0		20.20			g area ÷ (4		0.4	(91)
												Ì	,	0.4	(,
Г						Ť) = fLA ×			'			T	1	(00)
(92)m=	19.49	19.61	19.84	20.19	20.46		.56 20.		20.57	20.51	20.17	19.79	19.48]	(92)
· · · · r					· ·		e from Ta			- 	·	1 40 70	1 40 40	1	(93)
(93)m=	19.49	19.61	19.84	20.19	20.46	20	.56 20.	.57	20.57	20.51	20.17	19.79	19.48		(93)
•		Ĭ.	uirement			امم	-t -t 1:	1 -6	Table 0	h aa 4ha	4 T: /	76)	ما ده مماد	loto	
			emarter or gains t			ieu a	at step 1	1 01	rable 9	b, so ma	ıt 11,111=(76)III an	u re-caic	ulate	
Γ	Jan	Feb	Mar	Apr	May	J	un J	ul	Aug	Sep	Oct	Nov	Dec]	
Utilisat			ains, hm	•	- 7					1				ı	
(94)m=	1	1	0.99	0.97	0.87	0.	64 0.4	46	0.53	0.85	0.98	1	1]	(94)
Useful	gains,	hmGm ,	W = (94)	1)m x (84	4)m		·			•	<u>I</u>			1	
(95)m=	570.22	620.37	678.6	747.11	734.43	546	6.31 369).72	385.6	543.09	565.95	544.61	546.32		(95)
Month	ly avera	age exte	rnal tem	perature	from Ta	able	8					•	•	ı	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	4.6 16	6.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat lo	oss rate	for mea	an intern	al tempe	erature,	Lm ,	, W =[(39)m 2	x [(93)m	– (96)m]	•	•	ı	
(97)m=	1488.17	1435.92	1297.52	1077.4	832.82	556	6.22 370).56	387.72	602.24	910.14	1215.42	1475.15		(97)
Space	heatin	g require	ement fo	r each m	nonth, k\	//h/ı	month =	0.02	24 x [(97	m – (95)m] x (4	1)m		<u>.</u>	
(98)m=	682.95	548.05	460.48	237.81	73.2		0 ()	0	0	256.08	482.99	691.05		
_									Tota	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	3432.6	(98)
Space	heatin	g require	ement in	kWh/m²	/year									28.02	(99)
•		- '			•										

9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating	provided by a community scheme		
Fraction of space heat from secondary/supplementary heating (Tab		0	(301)
Fraction of space heat from community system $1 - (301) =$		1	(302)
The community scheme may obtain heat from several sources. The procedure allow		he latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See a Fraction of heat from Community heat pump	Appendix C.	1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	5 ,	1.25	(306)
Space heating		∟kWh/yea	
Annual space heating requirement		3432.6	_
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	4290.75	(307a)
Efficiency of secondary/supplementary heating system in % (from T	Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		2242.35	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2802.94	(310a)
Electricity used for heat distribution	$0.01 \times [(307a)(307e) + (310a)(310e)] =$	70.94	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):			(0.0)
mechanical ventilation - balanced, extract or positive input from out	side	319.08	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	319.08	(331)
Energy for lighting (calculated in Appendix L)		454.09	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-798.65	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	o fuels repeat (363) to (366) for the second fuel		(367a)
CO2 associated with heat source 1 [(307b)+(310	b)] x 100 ÷ (367b) x 0.52 =	1154.12	(367)
Electrical energy for heat distribution [(313	3) x 0.52 =	36.82	(372)
)(366) + (368)(372) =		(373)
CO2 associated with space heating (secondary) (309			(374)
, 5 (),	,		` ′

CO2 associated with water from immersion heater or instantaneous heater (375)0.52 Total CO2 associated with space and water heating (373) + (374) + (375) =(376)1190.93 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 165.6 0.52 CO2 associated with electricity for lighting (332))) x (379)0.52 235.67 Energy saving/generation technologies (333) to (334) as applicable x 0.01 = Item 1 0.52 -414.5 (380)sum of (376)...(382) =Total CO2, kg/year (383)1177.71 $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)9.61 El rating (section 14) (385) 90.58

				User D	etails:						
Assessor Name:					Strom	a Num	ber:				
Software Name:	Stroma FS	SAP 201	2		Softwa	are Ve	rsion:		Versio	n: 1.0.4.26	
	Property Address: C84_Be Green										
Address :											
1. Overall dwelling dime	ensions:				4 0						0)
Ground floor						(1a) x			(2a) =		<u> </u>
	a) ı (1b) ı (1a) ı	(14) . (16	\					2.0](24) -	343	(0a)
	a)+(10)+(10)+	(14)+(16	:) (11	')1	22.5) . (2-) . (2-l	1) . (2-) .	(0-)		_
Dwelling volume						(3a)+(3b)+(3c)+(3d	I)+(3e)+	.(3n) =	343	(5)
2. Ventilation rate:	main	0.4	o o o o d o o	•	othor		total			m³ nor hou	
		<u>_h</u>		-	other	, –	lotai			m ^o per not	_
Number of chimneys	0		0	_	0] ⁼	0	X 4	40 =	0	(6a)
Number of open flues	0	+	0	_] +	0	_ = _	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns						4	Χ.	10 =	40	(7a)
Number of passive vents							0	X '	10 =	0	(7b)
Number of flueless gas fi	res						0	X 4	40 =	0	(7c)
						_					
						_		<u>L</u>	Air ch	anges per h	our —
									÷ (5) =	0.12	(8)
			ea, procee	a to (17), (otnerwise (continue ir	om (9) το (16)		0	(9)
Additional infiltration		,						[(9)	-1]x0.1 =		
Structural infiltration: 0	.25 for steel o	r timber t	frame or	0.35 fo	r masoni	y consti	ruction			0	(11)
			ponding to	the great	er wall are	a (after					
•			ed) or 0	.1 (seale	ed), else	enter 0				0	(₁₂
If no draught lobby, en	ter 0.05, else	enter 0	•		·					0	=
Percentage of windows	s and doors d	raught st	ripped							0	(14
Window infiltration					0.25 - [0.2	x (14) ÷ 1	00] =			0	(15
Infiltration rate										0	(16
•					•	•	etre of e	nvelope	area		=
· ·	-						is heina u	haa		0.37	(18
Number of sides sheltere		on tool nac	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	io oi a aog	groo an po	modbinty	io boiling at	30 u		2	(19
Shelter factor					(20) = 1 -	[0.0 75 x (1	19)] =				→ ` `
Infiltration rate incorporat	ing shelter fa	ctor			(21) = (18	x (20) =				0.31	(21
Infiltration rate modified f	or monthly wi	nd speed	<u> </u>							•	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tab	le 7								1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4										
	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	l	

Adjusted infiltra	ation rate ((allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.4	0.39	0.38	0.34	0.33	0.3	0.3	0.29	0.31	0.33	0.35	0.37			
Calculate effec		_	rate for t	he appli	cable ca	se	•	•	•	•	•	<u>. </u>		٦.
If mechanica			andiv N. (2	2h) _ (22a) Em. (auation (I	VE)) otho	muiaa (22h) - (220)				0	(23a
If exhaust air he) = (23a)				0	(23b
If balanced with		-	-	_					.	001) [4 (00.)		0	(230
a) If balance	-				1	- 		 	<u> </u>) ÷ 100] 1		(246
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]		(24a
b) If balance					1			í `	r Ó - Ò	- 	1 .	1		(0.41
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]		(24b
c) If whole he				-	-				E (22h	.\				
(24c)m = 0	$\frac{1 < 0.5 \times (2)}{0}$	23b), t	nen (240	(23L) = (23L)		MISE (24	$C_0 = (22)$) III + 0.	.5 × (23L	0	0	1		(240
(''					<u> </u>					0]		(2-10
d) If natural vi	ventilation n = 1, then				•				0.5]			-		
(24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(240
Effective air	change ra	ite - en	iter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)						
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(25)
3. Heat losses	and heat	loss r	narameta	or.					_		_		-	
ELEMENT	Gross	1033	Openin	gs	Net Ar	ea	U-val		AXU		k-valu		АХ	
	area (m	n²)	m	2	A ,r	n²	W/m2	2K\	(W/I	<u><)</u>	kJ/m²•	K	kJ/	K
Doo <mark>rs Ty</mark> pe 1					2.1	X	1.2	=	2.52					(26)
Doors Type 2					4	X	1.2	- [4.8					(26)
Doors Type 3					2.3	X	1	=	2.3					(26)
Windows Type	1				3.2	x1	/[1/(1.4)+	0.04] =	4.24					(27)
Windows Type	2				1.9	x1	/[1/(1.4)+	0.04] =	2.52					(27)
Windows Type	3				4.3	x1	/[1/(1.4)+	0.04] =	5.7					(27)
Windows Type	4				4	x1	/[1/(1.4)+	0.04] =	5.3	Ħ				(27)
Windows Type	5				3.3	x1	/[1/(1.4)+	0.04] =	4.37	一				(27)
Windows Type	6				3.3	_{x1}	/[1/(1.4)+	· 0.04] =	4.37	=				(27)
Windows Type					1.3		/[1/(1.4)+	Ļ	1.72	=				(27)
Floor	•					=				╡ ┌		\neg		(28)
Walls	70.00	_			122.5		0.13	=	15.925	<u> </u>		=		=
	78.96		29.7		49.26	=	0.18	=	8.87					(29)
Total area of e					201.4									(31)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	is given in	paragrapi	h 3.2		
Fabric heat los				pan			(26)(30) + (32) =				6	2.65	(33)
Heat capacity		•	,					((28)	(30) + (32	2) + (32a).	(32e) =		834.4	(34)
Thermal mass	,	,	P = Cm ÷	- TFA) ir	n kJ/m²K			., ,	tive Value	, , ,	. ,		250	(35)
For design assess	•	,		,			ecisely the				able 1f		_00	(۵۵)
-						•	•							
can be used instea	ad of a detail	ed calcu	ılatıon.											_

if details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric hea	at loss							(33) +	(36) =			72.72	(37)
Ventilation hea	at loss ca	alculated	monthl	/	1	,	•	(38)m	= 0.33 × (25)m x (5))	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 65.53	65.18	64.84	63.25	62.95	61.56	61.56	61.3	62.09	62.95	63.55	64.18		(38)
Heat transfer of	oefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 138.25	137.9	137.56	135.97	135.67	134.28	134.28	134.02	134.81	135.67	136.27	136.9		
Heat loss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷		12 /12=	135.96	(39)
(40)m= 1.13	1.13	1.12	1.11	1.11	1.1	1.1	1.09	1.1	1.11	1.11	1.12		
							•		Average =	Sum(40) ₁	12 /12=	1.11	(40)
Number of day			le 1a)		<u> </u>	ı	ī		<u> </u>	<u> </u>	ı	l	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	ipancy, I	N								2	.87		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.01		(:=)
if TFA £ 13.9		40	ua in litua	o nou da	\/ d a		(05 × N)	. 20					(10)
Annual averag Reduce the annua									se target o		2.42		(43)
not m <mark>ore th</mark> at 125	litres per p	person per	day (all w	rater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 112.66	108.57	104.47	100.37	96.28	92.18	92.18	96.28	100.37	104.47	108.57	112.66		
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600		Total = Su oth (see Ta			1229.06	(44)
(45)m= 167.08	146.13	150.79	131.46	126.14	108.85	100.87	115.74	117.13	136.5	149	161.8		
		ļ		<u> </u>	ļ	<u> </u>	<u>!</u>		rotal = Su	<u>I</u>	! =	1611.49	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)			'		
(46)m= 25.06	21.92	22.62	19.72	18.92	16.33	15.13	17.36	17.57	20.48	22.35	24.27		(46)
Water storage					/\/\ IDO		10.1		1			· I	
Storage volum	` ,		•			_		ame ves	sei		150		(47)
If community h Otherwise if no	•			•			` '	are) anto	or 'O' in <i>(</i>	17 \			
Water storage		not wate	i (uno n	iciuues i	nstantai	ieous cc	JITIDI DOII	croj crite	51 0 111 (71)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	.39		(48)
Temperature fa	actor fro	m Table	2b							0.	.54		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	.75		(50)
b) If manufact	urer's de	eclared o	ylinder l	oss fact							-		` '
Hot water stora	•			e 2 (kW	h/litre/da	ay)					0		(51)
If community h Volume factor	_		on 4.3								0	1	(50)
Temperature fa			2b							—	0		(52) (53)
Energy lost fro				aar			(A7) v (51)	v (52) v (53) –			[
Enter (50) or (_	, KVVII/YE	zai			(47) x (51)	, A (JZ) X (00 <i>j</i> =	-	0 .75		(54) (55)
5. (50) 51 (, (0	/											(00)

Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58 23.33 22.58 23.33 (2.58	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23.26 (22.51 23	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 213.67 188.21 197.38 176.55 172.74 153.94 147.46 162.34 162.22 183.09 194.09 208.4	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 213.67 188.21 197.38 176.55 172.74 153.94 147.46 162.34 162.22 183.09 194.09 208.4	
Output from water heater (annual) ₁₁₂ 2160.1	(64)
Heat gains from water heating, kWh/month 0.25 ^[0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 92.83 82.26 87.41 79.78 79.22 72.27 70.81 75.76 75.02 82.66 85.62 91.08	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 143.62 14	(66) (67)
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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orienta	tion:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	3.2	x	10.63	x	0.63	x	0.7] =	10.4	(74)
North	0.9x	0.77	х	1.9	x	10.63	x	0.63	x	0.7	=	6.17	(74)
North	0.9x	0.77	x	4.3	x	10.63	x	0.63	x	0.7	=	13.97	(74)
North	0.9x	0.77	x	4	x	10.63	x	0.63	x	0.7] =	13	(74)
North	0.9x	0.77	х	3.3	x	10.63	x	0.63	x	0.7	=	10.72	(74)
North	0.9x	0.77	x	3.3	x	10.63	x	0.63	x	0.7	=	10.72	(74)
North	0.9x	0.77	x	1.3	x	10.63	x	0.63	x	0.7	=	4.22	(74)
North	0.9x	0.77	x	3.2	x	20.32	x	0.63	x	0.7	=	19.87	(74)
North	0.9x	0.77	x	1.9	x	20.32	x	0.63	x	0.7	=	11.8	(74)
North	0.9x	0.77	x	4.3	x	20.32	x	0.63	x	0.7	=	26.7	(74)
North	0.9x	0.77	x	4	x	20.32	x	0.63	x	0.7	=	24.84	(74)
North	0.9x	0.77	x	3.3	x	20.32	x	0.63	x	0.7	=	20.49	(74)
North	0.9x	0.77	x	3.3	x	20.32	x	0.63	x	0.7	=	20.49	(74)
North	0.9x	0.77	x	1.3	x	20.32	x	0.63	x	0.7	=	8.07	(74)
North	0.9x	0.77	x	3.2	x	34.53	x	0.63	x	0.7	=	33.77	(74)
North	0.9x	0.77	X	1.9	X	34.53	X	0.63	X	0.7] =	20.05	(74)
North	0.9x	0.77	x	4.3	x	34.53	x	0.63	x	0.7		45.38	(74)
North	0.9x	0.77	x	4	х	34.53] x	0.63	x	0.7	=	42.21	(74)
North	0.9x	0.77	x	3.3	x	34.53	x	0.63	x	0.7	=	34.82	(74)
North	0.9x	0.77	x	3.3	x	34.53	х	0.63	x	0.7	=	34.82	(74)
North	0.9x	0.77	x	1.3	x	34.53	×	0.63	x	0.7	=	13.72	(74)
North	0.9x	0.77	x	3.2	x	55.46	x	0.63	x	0.7	=	54.24	(74)
North	0.9x	0.77	x	1.9	x	55.46	x	0.63	x	0.7	=	32.21	(74)
North	0.9x	0.77	x	4.3	x	55.46	x	0.63	x	0.7	=	72.89	(74)
North	0.9x	0.77	x	4	X	55.46	x	0.63	X	0.7	=	67.8	(74)
North	0.9x	0.77	x	3.3	x	55.46	x	0.63	x	0.7	=	55.94	(74)
North	0.9x	0.77	x	3.3	X	55.46	x	0.63	X	0.7	=	55.94	(74)
North	0.9x	0.77	x	1.3	X	55.46	X	0.63	X	0.7	=	22.04	(74)
North	0.9x	0.77	x	3.2	x	74.72	x	0.63	X	0.7	=	73.07	(74)
North	0.9x	0.77	x	1.9	X	74.72	X	0.63	X	0.7	=	43.38	(74)
North	0.9x	0.77	x	4.3	X	74.72	x	0.63	X	0.7	=	98.19	(74)
North	0.9x	0.77	x	4	x	74.72	x	0.63	x	0.7	=	91.34	(74)
North	0.9x	0.77	x	3.3	x	74.72	x	0.63	X	0.7	=	75.35	(74)
North	0.9x	0.77	x	3.3	X	74.72	x	0.63	X	0.7	=	75.35	(74)
North	0.9x	0.77	x	1.3	x	74.72	x	0.63	x	0.7	=	29.68	(74)
North	0.9x	0.77	x	3.2	x	79.99	x	0.63	x	0.7	=	78.22	(74)
North	0.9x	0.77	x	1.9	x	79.99	x	0.63	x	0.7	=	46.44	(74)
North	0.9x	0.77	x	4.3	x	79.99	x	0.63	x	0.7	=	105.11	(74)
North	0.9x	0.77	X	4	X	79.99	×	0.63	X	0.7	=	97.78	(74)

North	0.9x	0.77	1 🗸	22	l .	70.00	1 .	0.00	١ ٧	0.7	1 _	00.07	(74)
North	-	0.77	X 	3.3	X I	79.99	l x	0.63	X	0.7] =]	80.67	╡
North	0.9x 0.9x	0.77	X I v	3.3	l x	79.99	l x	0.63	X	0.7	= _	80.67	
North	0.9x	0.77	l X l ,	1.3	l x	79.99	l x	0.63	X	0.7	= _	31.78	$\int_{(74)}^{(74)}$
North	<u> </u>	0.77	X I	3.2	l X	74.68	l x	0.63	X	0.7] =]	73.03	$\int_{(74)}^{(74)}$
North	0.9x 0.9x	0.77	X I v	1.9	l x	74.68	l x	0.63	X	0.7	= _	43.36	
North	0.9x	0.77	l X l ,	4.3	l x l	74.68	l x	0.63	X	0.7] = _	98.14	$\frac{1}{7}^{(74)}$
North	0.9x	0.77	X	4	X I v	74.68	l x	0.63	X	0.7] = _	91.29	$\int_{(74)}^{(74)}$
North	0.9x	0.77	x x	3.3	x	74.68	l x	0.63	X	0.7	= =	75.31	$\int_{(74)}^{(74)}$
North	0.9x	0.77	^ x	1.3	^ x	74.68 74.68	x x	0.63	X	0.7]	75.31 29.67	
North	0.9x	0.77] ^ x	3.2	^ x	59.25] ^] _x	0.63	X	0.7	- =	57.94	
North	0.9x	0.77	^ x	1.9	^ x	59.25] ^ x	0.63	X	0.7	- =	34.4	
North	0.9x	0.77] ^] _X	4.3	l ^ l x	59.25] ^] _x	0.63	X	0.7		77.86	= (74)
North	0.9x	0.77] ^ x	4.3	^ x	59.25] ^ x	0.63	X	0.7]	72.43	
North	0.9x	0.77	^ x	3.3	l ^	59.25	l ^ l x	0.63	X	0.7		59.75	(74)
North	0.9x	0.77	l x	3.3	l ^	59.25	l ^ l x	0.63	X	0.7	! _	59.75	(74)
North	0.9x	0.77	l x	1.3	X	59.25] ^] _X	0.63	x	0.7	! _	23.54	(74)
North	0.9x	0.77	X	3.2	X	41.52	X	0.63	X	0.7		40.6	(74)
North	0.9x	0.77	l X	1.9	X	41.52	X	0.63	x	0.7	=	24.11	(74)
North	0.9x	0.77	X	4.3	X	41.52	X	0.63	X	0.7	! =	54.56	(74)
North	0.9x	0.77	X	4	X	41.52	x	0.63	x	0.7	 =	50.75	(74)
North	0.9x	0.77	X	3.3	x	41.52	Х	0.63	X	0.7	 =	41.87	(74)
North	0.9x	0.77	X	3.3	x	41.52	X	0.63	x	0.7	=	41.87	(74)
North	0.9x	0.77	X	1.3	х	41.52	x	0.63	x	0.7	=	16.49	(74)
North	0.9x	0.77	x	3.2	х	24.19	x	0.63	x	0.7	=	23.66	(74)
North	0.9x	0.77	×	1.9	x	24.19	x	0.63	x	0.7	j =	14.05	(74)
North	0.9x	0.77	x	4.3	x	24.19	x	0.63	x	0.7	=	31.79	(74)
North	0.9x	0.77	X	4	x	24.19	x	0.63	x	0.7	=	29.57	(74)
North	0.9x	0.77	×	3.3	x	24.19	x	0.63	x	0.7	=	24.4	(74)
North	0.9x	0.77	X	3.3	x	24.19	X	0.63	x	0.7	=	24.4	(74)
North	0.9x	0.77	X	1.3	x	24.19	X	0.63	X	0.7	=	9.61	(74)
North	0.9x	0.77	X	3.2	x	13.12	x	0.63	x	0.7	=	12.83	(74)
North	0.9x	0.77	X	1.9	X	13.12	X	0.63	x	0.7	=	7.62	(74)
North	0.9x	0.77	X	4.3	X	13.12	X	0.63	x	0.7	=	17.24	(74)
North	0.9x	0.77	X	4	x	13.12	x	0.63	x	0.7	=	16.04	(74)
North	0.9x	0.77	x	3.3	x	13.12	x	0.63	x	0.7	=	13.23	(74)
North	0.9x	0.77	x	3.3	x	13.12	x	0.63	X	0.7	=	13.23	(74)
North	0.9x	0.77	X	1.3	x	13.12	x	0.63	X	0.7	=	5.21	(74)
North	0.9x	0.77	x	3.2	x	8.86	x	0.63	X	0.7	=	8.67	(74)
North	0.9x	0.77	X	1.9	x	8.86	x	0.63	X	0.7	=	5.15	(74)
North	0.9x	0.77	X	4.3	X	8.86	X	0.63	X	0.7	=	11.65	(74)

North	0.9x	0.77	X	4		x	8	3.86	x		0.63	x	0.7	=	10.84	(74)
North	0.9x	0.77	х	3.	3	x	8	8.86	x		0.63	х	0.7	=	8.94	(74)
North	0.9x	0.77	x	3.	3	x	8	8.86	x		0.63	x	0.7		8.94	(74)
North	0.9x	0.77	x	1.3	3	x	8	3.86	x		0.63	_ x _	0.7	-	3.52	(74)
	_															
Solar	gains in	watts, ca	alculated	d for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m=	69.22	132.28	224.78	361.05	486.37	52	20.67	486.11	385	.67	270.25	157.46	85.39	57.7		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m ·	+ (8	33)m	, watts		•						
(84)m=	577.22	638.04	713.81	822.84	920	92	27.51	875.75	781	.84	680.59	595.28	554.84	551.34		(84)
7. Me	an inter	nal temp	erature	(heating	season)										
		during h		·			area f	from Tab	ole 9	, Th	1 (°C)				21	(85)
		tor for g				-				,	()					`
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.94	⊢	0.81	0.64	0.7	-	0.94	0.99	1	1		(86)
, ,		1.1		l	T4 ((- 1 -	0			. 0 -)		<u> </u>	l		
		l temper						i —				20.27	40.07	40.05		(87)
(87)m=	19.67	19.78	20.01	20.36	20.69		0.91	20.98	20.	96	20.77	20.37	19.97	19.65		(07)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Tr	n2 (°C)				1	
(88)m=	19.98	19.98	19.98	19.99	19.99		20	20	20.	01	20	19.99	19.99	19.99		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	ee Table	9a)							
(89)m=	1	1	1	0.98	0.91	9).72	0.51	0.	6	0.9	0.99	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na	T2 (fc	ollow ste	ns 3	to 7	in Tabl	e 9c)				
(90)m=	18.18	18.35	18.69	19.2	19.67	Ť	9.94	20	19.	$\overline{}$	19.79	19.22	18.63	18.17		(90)
											f	LA = Livin	g area ÷ (4	4) =	0.4	(91)
N 4 a a s	. into we	Lannan	atuma (fa	ماديد محافية	مبيراء ماء	II:	د د	ΛΤ4	. /4	£I	A) TO					
(92)m=	18.78	temper	19.22	19.66	20.08	_	9) = n 0.33	20.39	+ (1 20.	\neg	20.19	19.68	19.17	18.76]	(92)
` '		nent to the						<u> </u>					10.17	10.70		(02)
(93)m=	18.78	18.93	19.22	19.66	20.08	_	0.33	20.39	20.		20.19	19.68	19.17	18.76		(93)
		iting requ			20.00		.0.00	20.00			20110		10111	10110		
		mean int			re obtair	ned	at ste	ep 11 of	Tabl	e 9h	o, so tha	t Ti.m=(76)m an	d re-calc	culate	
		factor fo		•				о р о.			, 00	•, (. 0,			
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										_		
(94)m=	1	1	0.99	0.98	0.91	(0.75	0.57	0.6	65	0.91	0.99	1	1		(94)
Usefu	ıl gains,	hmGm ,	W = (9	4)m x (8	4)m										-	
(95)m=	576.5	636.56	709.52	803.96	839.67	69	97.69	496.11	508	.14	616.75	588.1	553.49	550.8		(95)
Mont	hly aver	age exte	rnal tem	perature	from Ta	able	e 8								1	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
		e for mea				_				_			i	ı	1	
(97)m=	2002			1463.58			69.67	509.09	533		820.53	1231.98	<u> </u>	1993.95		(97)
•		g require				Nh.				Ť		<u>`</u>			1	
(98)m=	1060.58	872.18	774.21	474.93	221.18		0	0			0	479.05	785.54	1073.71		_
										Total	per year	(kWh/year	r) = Sum(9	8) _{15,912} =	5741.36	(98)
Spac	e heatin	g require	ement in	kWh/m²	?/year										46.87	(99)

9a. Energy requirements – Ind	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heating:		<u> </u>									
Fraction of space heat from s			mentary	system		(224)				0	(201)
Fraction of space heat from m	-				(202) = 1					1	(202)
Fraction of total heating from	•				(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heat	•									93.5	(206)
Efficiency of secondary/suppl	ementar	y heating	g systen	ո, % 		,				0	(208)
Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	year
Space heating requirement (c	alculate	d above)	0	0	0	0	479.05	785.54	1073.71	1	
		ļ	0		1 0		479.03	700.04	1073.71	J	(04.4)
$(211)m = \{[(98)m \times (204)] \} \times 1$ $1134.31 932.81 828.03$	507.94	236.55	0	0	0	0	512.35	840.15	1148.35	1	(211)
1104.01 002.01 020.00	007.04	200.00					ar) =Sum(2			6140.5	(211)
Space heating fuel (secondar	v). kWh/	month					,	7 10,101	_	000	` ′
$= \{[(98)\text{m x } (201)]\} \times 100 \div (201)$	• /									_	
(215)m= 0 0 0	0	0	0	0	0	0	0	0	0		
					Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water heating											
Output from water heater (calc 213.67 188.21 197.38	ulated a 176.55	172.74	153.94	147.46	162.34	162.22	183.09	194.09	208.4		
Efficiency of water heater	170.00		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		192.01			1000		79.8	(216)
(217)m= 88.51 88.4 88.1	87.33	85.47	79.8	79.8	79.8	79.8	87.26	88.16	88.57		(217)
Fuel for water heating, kWh/m	onth										
(219) m = (64) m x $100 \div (217)$		202.00	100.01	404.70	1 202 42	202.00	1 200 00	220.40	1 005 00	1	
(219)m= 241.41 212.92 224.05	202.18	202.09	192.91	184.79	203.43 Tota	203.28 I = Sum(2	209.82 19a) =	220.16	235.29	2532.33	(219)
Annual totals								Wh/yeaı	r	kWh/ye	
Space heating fuel used, main	system	1					•••	, y ou.	•	6140.5	<u></u>
Water heating fuel used										2532.33	Ħ
Electricity for pumps, fans and	electric	keep-ho	t								
central heating pump:	0.000		-						30	1	(2300
] 1	
boiler with a fan-assisted flue									45		(2306
Total electricity for the above, I	kWh/yea	ır			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										454.09	(232)
12a. CO2 emissions – Individ	ual heat	ing syste	ms incl	uding mi	icro-CHF						
				e rgy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emission kg CO2/y	_
				4.					_	4000.05	(261)
Space heating (main system 1)		(21)	1) x			0.2	16	=	1326.35	[(201)
)			1) x 5) x					=		
Space heating (secondary))		(21	5) x			0.5	19	=	0	(263)
Space heating (main system 1 Space heating (secondary) Water heating Space and water heating)		(21)	5) x 9) x	+ (263) + ((264) –		19			

Electricity for pumps, fans and electric keep-hot (231) x 0.519 = 38.93 (267) Electricity for lighting (232) x 0.519 = 235.67 (268) Total CO2, kg/year sum of (265)...(271) = 2147.93 (272)

TER = 25.94 (273)

		User Details	:					
Assessor Name: Software Name:	Stroma FSAP 2012		ma Num ware Ve	rsion:		Versio	on: 1.0.4.26	
Address :	r	roperty Addre	55. AUO_D	e Green				
1. Overall dwelling dimer	nsions:							
0 14		Area(m²)	_	Av. He	ight(m)	٦	Volume(m ²	<u> </u>
Ground floor		39	(1a) x	2	2.8	(2a) =	109.2	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1r	1) 39	(4)					
Dwelling volume			(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	(3n) =	109.2	(5)
2. Ventilation rate:								
	main secondar heating heating	y othei		total			m³ per hou	ır
Number of chimneys	0 + 0	+ 0	=	0	X	40 =	0	(6a)
Number of open flues	0 + 0	+ 0	=	0	X	20 =	0	(6b)
Number of intermittent far	าร			0	x	10 =	0	(7a)
Number of passive vents				0	x	10 =	0	(7b)
Number of flueless gas fir	res			0	X	40 =	0	(7c)
	(Co) (Ch) (Ch)	75) (75) (75)					nanges per ho	_
	rs, flues and fans = (6a)+(6b)+(7 een carried out or is intended, proceed		se continue f	0 from (9) to (\div (5) =	0	(8)
Number of storeys in th		(10), 1000		(0) 10 (, ,		0	(9)
Additional infiltration					[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame or		•	ruction			0	(11)
if both types of wall are pro deducting areas of opening	esent, use the value corresponding to gs); if equal user 0.35	the greater wall	area (after					
If suspended wooden fl	loor, enter 0.2 (unsealed) or 0.	.1 (sealed), el	se enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0						0	(13)
<u> </u>	and doors draught stripped						0	(14)
Window infiltration			0.2 x (14) ÷	•	. (45)		0	(15)
Infiltration rate	aEO avaragad in aubia matra		(0) + (11) + (0.00	0	(16)
•	q50, expressed in cubic metre ty value, then $(18) = [(17) \div 20] + (8)$	•	•	ietre oi e	envelope	area	3	(17)
·	s if a pressurisation test has been don			is being u	sed		0.15	(10)
Number of sides sheltered	d						2	(19)
		(20) =	1 - [0.075 x (19)] =			0.85	(20)
Shelter factor			$(18) \times (20) =$				0.13	
Infiltration rate incorporati		(21) =	(10) X (20) =					(21)
Infiltration rate incorporati	or monthly wind speed	· · ·		1 -	T	Ι_	7	(21)
Infiltration rate incorporati Infiltration rate modified fo	or monthly wind speed Mar Apr May Jun	(21) =		Oct	Nov	Dec]	(21)
Infiltration rate incorporati Infiltration rate modified for Jan Feb Monthly average wind spe	or monthly wind speed Mar Apr May Jun eed from Table 7	Jul Au	g Sep	·		1]	(21)
Infiltration rate incorporati Infiltration rate modified for Jan Feb Monthly average wind spe	or monthly wind speed Mar Apr May Jun	· · ·		Oct 4.3	Nov 4.5	Dec 4.7]	(21)
Infiltration rate incorporati Infiltration rate modified for Jan Feb Monthly average wind spe	or monthly wind speed Mar Apr May Jun eed from Table 7 4.9 4.4 4.3 3.8	Jul Au	g Sep	·		1]	(21)

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
alculate effec		•	rate for t	he appli	cable ca	se							
If mechanica			l' N. (6	OL) (00	\ - /	/	15// (1	. (201) (00)			0.5	(2
If exhaust air he) = (23a)			0.5	(2
If balanced with		-	•	_								76.5	(2
a) If balance					1	- ` ` 	- ^ ` ` - 	```	 	- 	· ` `) ÷ 100] 1	(0
a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27]	(2
b) If balance					1	· ·	<u> </u>	í È	<u> </u>		1	1	
b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h				•	•				F (00)	,			
if (22b)n		<u> </u>		ŕ	<u>,</u>	· ` `	ŕ	ŕ	<u> </u>		Ι .	1	()
c)m= 0	0	0		0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n				•	•				0.5]				
d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change	rate - er	nter (24a) or (24h	o) or (24	c) or (24	d) in box	(25)			•	-	
)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
Heet lesses	and be	ot loss i	o romot	0.51								_	-
. Heat losse	Gros		Openin		Net Ar	200	U-valı	10	AXU		k-valu	0	AXk
<u>EME</u> NT	area		Operiin		A ,r		W/m2		(W/ł	<)	kJ/m ² ·		kJ/K
o <mark>rs Ty</mark> pe 1					2.5	x	1.3	= [3.25				(2
ors Type 2					2.5	X	1	= -	2.5	Ħ			(2
ndows Type	1				1.3	x1,	/[1/(1.3)+	0.04] =	1.61	Ħ			(2
ndows Type					2.5	-	/[1/(1.3)+	0.041 =	3.09	4			(2
ndows Type					4.1		· /[1/(1.3)+	Ļ	5.07	╡			(2
alls		, <u>,</u>	12.0			=	- ` '			╡ ,			(2
	31.9		12.9		19.02	=	0.15	=	2.85				
tal area of e			effo otivo vvi	ndow II w	31.92		formula 1	/[/1/	· 0 0 0 41 o	a siran in	no roor ron	h 2 2	(3
or windows and nclude the area						ateu usirig	TOTTIUIA T	/[(e)+0.04j a	is giveri iri	paragrapi	1 3.2	
bric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				18.37	(3
at capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
ermal mass	parame	ter (TMF	c = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Medium		250	(3
design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste													
ermal bridge	•	,		•	•	<						1.6	(3
etails of therma tal fabric he		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	(36) =			=	
		alouloto -	l manthi							25\m v (5)		19.97	(3
ntilation hea		1			1	1, .1	Λ		= 0.33 × (i e	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(3
)m= 10.09	9.98	9.86	9.29	9.17	8.6	8.6	8.48	8.83	9.17	9.4	9.63	J	(-
at transfer o	oefficier	nt, W/K	ı					(39)m	= (37) + (3	38)m		7	

at loss para	ameter (F	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
)m= 0.77	0.77	0.76	0.75	0.75	0.73	0.73	0.73	0.74	0.75	0.75	0.76		
ımber of da	ve in moi	oth (Tah	(د ۱ ما						Average =	Sum(40) ₁	12 /12=	0.75	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(
	Į				<u> </u>	<u> </u>	ļ	ļ		<u> </u>	<u> </u>		
. Water hea	iting ene	rgy requi	irement:								kWh/ye	ear:	
sumed occ if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		38		(
nual averag duce the annu more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		5.98		(
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage	in litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)			,		•	
)m= 73.67	70.99	68.31	65.64	62.96	60.28	60.28	62.96	65.64	68.31	70.99	73.67		_
ergy content o	f hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		803.71	
)m= 109.25	95.56	98.6	85.97	82.49	71.18	65.96	75.69	76.59	89.26	97.43	105.81		
									Total = Su	m(45) ₁₁₂ =	=	1053.78	
st <mark>antane</mark> ous i	water heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
m= 16.39 ater storage	14.33	14.79	12.89	12.37	10.68	9.89	11.35	11.49	13.39	14.62	15.87		
orage volun		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		
community I	heating a	ınd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
nerwise if n		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
iter storage If manufac		aclared l	nee facto	or ie kno	wn (k\//k	v(qəv).					00	Ī	
mperature				טווא פו וכ	wii (Kvvi	i/uay).					.6		
ergy lost fro				ear			(48) x (49)) =			.0		
If manufac		•	•		or is not		(-) (-,	,			.50		
t water sto	•			e 2 (kW	h/litre/da	ıy)					0		
ommunity l lume factor	_		on 4.3								0		
mperature			2b							-	0		
ergy lost fro				ear			(47) x (51)) x (52) x (53) =		0		
nter (50) or		-	,						,	-	98		
iter storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		
l linder contair		d solar sto	rage, (57)ı					7)m = (56)	m where (m Append	I lix H	
)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		
mary circui	t loss (ar	nual) fro	m Table	· 3	-	-	•	•	•		0		
mary circui	•	,			59)m = ((58) ÷ 36	65 × (41)	m				•	
•	y factor fi				•	. ,	, ,		r thermo	stat)			
modined b												_	

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
				`	ì	`		П	0	0	Τ ο	Ι ο	1	(61)
													J (59)m + (61)m	(0.)
(62)m= 162.8		152.18	137.82	136.07	123.		129.	_	128.44	142.84	``	159.39	(59)111 + (61)111	(62)
Solar DHW input					l								J	(02)
(add addition										COILLID	dion to wate	or ricating)		
(63)m= 0	0	0	0	0	0		0		0	0	0	0]	(63)
Output from	 water hea	ter		<u> </u>	ļ		ļ					<u> </u>	I	
(64)m= 162.8		152.18	137.82	136.07	123.	03 119.54	129.	27	128.44	142.84	149.29	159.39]	
` /		<u> </u>		<u> </u>			<u> </u>		ut from wa	ter heat	 er (annual)₁	l12	1684.65	(64)
Heat gains f	rom water	heating.	kWh/m	onth 0.2	5 ′ [0	.85 × (45)m							1	J
(65)m= 79.19		75.65	70.07	70.29	65.	- 	68.0	- 1	66.95	72.54	73.88	78.05]	(65)
` '		culation o	rf (65)m	only if c	vlind	er is in the	dwelli	ina d	or hot w	ater is	from com	munity h	I neating	
· ·	•				<i>,</i>								.oag	
5. Internal gains (see Table 5 and 5a):Metabolic gains (Table 5), Watts														
Jar		Mar	Apr	May	Ju	ın Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 69	69	69	69	69	69	69	69) \	69	69	69	69		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L	9 or L9a), a	lso se	ee T	able 5					
(67)m= 10.62		7.67	5.81	4.34	3.6		5.1		6.91	8.78	10.24	10.92		(67)
Appliances (gains (calc	ulated ir	Append	dix L, eg	uatio	n L13 or L1	3a), a	also	see Tal	ole 5				
(68)m= 119.0	3 120.26	117.15	110.52	102.16	94.	3 89.05	87.8	31	90.92	97.55	105.91	113.78		(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L	.15 or L15a), also	o se	e Table	5		•	•	
(69)m= 29.9	29.9	29.9	29.9	29.9	29.	9 29.9	29.	9	29.9	29.9	29.9	29.9		(69)
Pumps and	fans gains	(Table 5	āa)								•	•		
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g.	evaporatic	n (nega	tive valu	es) (Tab	le 5)	•			-		•			
(71)m= -55.2	2 -55.2	-55.2	-55.2	-55.2	-55	.2 -55.2	-55.	.2	-55.2	-55.2	-55.2	-55.2		(71)
Water heating	ng gains (T	able 5)		•		•	•				•	•	•	
(72)m= 106.4	4 104.89	101.68	97.31	94.48	90.4	48 87.09	91.4	14	92.98	97.5	102.61	104.9		(72)
Total intern	al gains =					(66)m + (67)m	ı + (68)m +	(69)m + (70)m +	(71)m + (72))m	_	
(73)m= 279.7	9 278.29	270.2	257.35	244.68	232.	15 223.8	228	.1	234.52	247.53	262.47	273.29		(73)
6. Solar ga	ns:						'				,			
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and as	sociated equa	itions t	o cor	nvert to th	e applica	able orienta	tion.		
Orientation:			Area			Flux			g_ 		FF		Gains	
	Table 6d		m²		_	Table 6a		1 8	able 6b		Table 6c		(W)	_
East 0.9	0.3	X	2.	5	x	19.64	х		0.53	×	0.82	=	5.76	(76)
East 0.9	0.3	X	4.	1	x	19.64	x		0.53	×	0.7	=	8.07	(76)
East 0.9	0.3	X	2.	5	x	38.42	x		0.53	×	0.82	=	11.27	(76)
East 0.9	0.3	X	4.	1	x	38.42	х		0.53	x	0.7	=	15.78	(76)
East 0.9	0.3	X	2.	5	х	63.27	х		0.53	x	0.82	=	18.56	(76)

	_								_						
East	0.9x	0.3		X	4.1	Х	. (63.27	X	0.53	X	0.7	=	25.99	(76)
East	0.9x	0.3		X	2.5	х	: (92.28	X	0.53	X	0.82	=	27.07	(76)
East	0.9x	0.3		X	4.1	Х	: 9	92.28	X	0.53	X	0.7	=	37.9	(76)
East	0.9x	0.3		X	2.5	Х	1	13.09	x	0.53	X	0.82	=	33.18	(76)
East	0.9x	0.3		X	4.1	х	1	13.09	x	0.53	X	0.7	=	46.45	(76)
East	0.9x	0.3		X	2.5	х	1	15.77	x	0.53	X	0.82	=	33.96	(76)
East	0.9x	0.3		X	4.1	х	1	15.77	x	0.53	X	0.7	=	47.55	(76)
East	0.9x	0.3		X	2.5	х	1	10.22	x	0.53	X	0.82	=	32.33	(76)
East	0.9x	0.3		X	4.1	х	1	10.22	x	0.53	X	0.7	=	45.27	(76)
East	0.9x	0.3		X	2.5	х	: (94.68	x	0.53	X	0.82	=	27.77	(76)
East	0.9x	0.3		X	4.1	х	: 9	94.68	х	0.53	X	0.7	=	38.88	(76)
East	0.9x	0.3		X	2.5	х	:	73.59	x	0.53	X	0.82	=	21.59	(76)
East	0.9x	0.3		X	4.1	х	:	73.59	x	0.53	X	0.7	=	30.22	(76)
East	0.9x	0.3		X	2.5	х		45.59	х	0.53	X	0.82	=	13.37	(76)
East	0.9x	0.3		X	4.1	х	: [45.59	x	0.53	X	0.7	=	18.72	(76)
East	0.9x	0.3		X	2.5	х		24.49	x	0.53	X	0.82	=	7.18	(76)
East	0.9x	0.3		X	4.1	х	: [24.49	х	0.53	X	0.7	=	10.06	(76)
East	0.9x	0.3		X	2.5	×		16.15	Х	0.53	X	0.82	=	4.74	(76)
East	0.9x	0.3		X	4.1	×		16.15	x	0.53	х	0.7	=	6.63	(76)
West	0.9x	0.77		X	1.3	×		19.64] x	0.53	х	0.7	=	6.56	(80)
West	0.9x	0.77		X	1.3	х		38.42	x	0.53	X	0.7	=	12.84	(80)
West	0.9x	0.77		X	1.3	×	. (63.27	Х	0.53	х	0.7	=	21.15	(80)
West	0.9x	0.77		X	1.3	×		92.28	X	0.53	х	0.7	=	30.84	(80)
West	0.9x	0.77		X	1.3	×	1	13.09	x	0.53	х	0.7	=	37.8	(80)
West	0.9x	0.77		X	1.3	х	1	15.77	x	0.53	X	0.7	=	38.69	(80)
West	0.9x	0.77		X	1.3	х	1	10.22	X	0.53	X	0.7	=	36.84	(80)
West	0.9x	0.77		X	1.3	Х	: 9	94.68	x	0.53	X	0.7	=	31.64	(80)
West	0.9x	0.77		X	1.3	х	-	73.59	x	0.53	X	0.7	=	24.6	(80)
West	0.9x	0.77		X	1.3	Х		45.59	X	0.53	X	0.7	=	15.24	(80)
West	0.9x	0.77		X	1.3	Х	: 2	24.49	X	0.53	X	0.7	=	8.19	(80)
West	0.9x	0.77		X	1.3	х		16.15	x	0.53	X	0.7	=	5.4	(80)
`				$\overline{}$	for each m					n = Sum(74)m				7	
(83)m=	20.39	39.89	65.7			7.42	120.2	114.44	98	.3 76.41	47.3	3 25.43	16.77		(83)
				_	(84)m = $(7$						1	_		1	(0.4)
(84)m=	300.18	318.18	335.	9	353.16 36	52.1	352.35	338.24	326	310.93	294.8	287.89	290.06		(84)
				,	heating se									1	
-		_		•	eriods in th		_		ole 9	, Th1 (°C)				21	(85)
Utilisa				-	ving area,	-	`			1.	1 -	. 1	Γ_	1	
(0.5)	Jan	Feb	Ma	\rightarrow		May	Jun	Jul	 	ug Sep	Oc	-	Dec		(00)
(86)m=	0.99	0.98	0.96			.72	0.52	0.37	0.4	ļ	0.89	0.97	0.99	J	(86)
		i			ving area	<u> </u>		i			1			1	:
(87)m=	20.47	20.56	20.7	1	20.89 20	0.98	21	21	2	1 20.99	20.8	9 20.67	20.46	J	(87)

T	4	al				al a III a a	f T.	.b.l. 0 T	LO (0 0)					
(88)m=	erature 20.28	20.28	eating p	erioas ir 20.3	20.3	20.31	20.31	20.31	n2 (°C) 20.31	20.3	20.29	20.29		(88)
` '			ains for					ļ	20.31	20.3	20.29	20.29		(00)
(89)m=	0.99	0.98	0.95	0.85	0.68	0.46	0.31	0.34	0.57	0.86	0.97	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 1	r 7 in Tabl	e 9c)	l .			
(90)m=	19.58	19.71	19.93	20.17	20.28	20.31	20.31	20.31	20.3	20.19	19.88	19.57		(90)
!								ı	1	LA = Livin	g area ÷ (4	1) =	0.54	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2			•		
(92)m=	20.06	20.17	20.35	20.55	20.65	20.68	20.68	20.68	20.67	20.57	20.3	20.04		(92)
Apply	adjustr	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	re appro	priate				
(93)m=	20.06	20.17	20.35	20.55	20.65	20.68	20.68	20.68	20.67	20.57	20.3	20.04		(93)
•			uirement											
			ternal ter or gains			ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	:										
(94)m=	0.98	0.97	0.95	0.86	0.7	0.49	0.34	0.37	0.6	0.87	0.97	0.99		(94)
			, W = (9 ⁴	,										
(95)m=	295.56	310.17	317.9	304.3	253.46	173.15	116.53	121.76	187.2	256.88	278.21	286.34		(95)
	aver 4.3	age exte	rnal tem	perature 8.9	e from Ta	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
(96)m=			an intern								7.1	4.2		(90)
(97)m=	473.61	457.13	413.08	340.95	260.84	173.65	116.56	121.82	189.24	290.4	387.72	468.97		(97)
		g requir	ement fo		nonth, k		th = 0.02	l)m – (95)m] x (4	1)m			
(98)m=	132.47	98.75	70.81	26.39	5.5	0	0	0	0	24.94	78.85	135.88		
		•	•					Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	573.57	(98)
Space	e heatin	g requir	ement in	kWh/m²	²/year							Ī	14.71	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme								
			ace hea								unity sch	neme.	0	(301)
	-			-		-	_	Table I	1) 0 11 11	OHE		[0	
	•		from co	•	•	`	,					l	1	(302)
			y obtain he s, geotherr							up to four (other heat	sources; th	ne latter	
Fractio	n of hea	at from (Commun	ity heat _l	pump								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribu	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m				Ī	1.25	(306)
Space	heatin	g											kWh/y	ear
Annual	space	heating	requiren	nent									573.57	
Space	heat fro	om Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) =	= [716.96	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
												-		

Space heating requirement from secon	dary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				1684.65	1
If DHW from community scheme: Water heat from Community heat pump)	(64) x (303a) x	(305) x (306) =	2105.81] (310a)
Electricity used for heat distribution		0.01 × [(307a)(307	'e) + (310a)(310e)] =	28.23] (313)
Cooling System Energy Efficiency Ratio)			0	(314)
Space cooling (if there is a fixed cooling	g system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra	· ,	tside		101.58	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/yea	r	=(330a) + (330	(b) + (330g) =	101.58	(331)
Energy for lighting (calculated in Appen	dix L)			187.63	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-255.24	(333)
Electricity generated by wind turbine (A	ppendix M) (negative quant	tity)		0	(334)
12b. CO2 Emissions – Community hear	ting scheme				
CO2 from other sources of space and v	vater heating (not CHP)	Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO <mark>2/yea</mark> r	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		kWh/year		kg CO <mark>2/yea</mark> r	(367a)
	If there is CHP using tw	kWh/year	kg CO2/kWh	kg CO2/year	(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP using tw	kWh/year o fuels repeat (363) to 0b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fuel	kg CO2/year	
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using tw [(307b)+(310	kWh/year o fuels repeat (363) to 0b)] x 100 ÷ (367b) x	(366) for the second fuel 0.52 = 0.52 =	319 459.25 14.65	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	[(307b)+(310) [(310) [(310)] [(310)] [(310)]	kWh/year o fuels repeat (363) to 0b)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(373)	(366) for the second fuel 0.52 = 0.52 =	319 459.25 14.65 473.9	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	[(307b)+(310 [(307b)+(310 [(310 systems (363 secondary) (308	kWh/year o fuels repeat (363) to ob)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(373)	(366) for the second fuel 0.52 = 0.52 = 2) =	319 459.25 14.65 473.9	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	If there is CHP using tw [(307b)+(310) [(31) [(31) systems (363) condary) (308) sion heater or instantaneou	kWh/year o fuels repeat (363) to ob)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(373)	(366) for the second fuel 0.52 = 0.52 = 0.52 = 0 =	319 459.25 14.65 473.9	(367) (372) (373) (374)
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			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2			Stroma Softwa	are Ve	rsion:		Versic	on: 1.0.4.26	
		Р	roperty.	Address:	A08_B	e Green				
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Overall dwelling dime	ensions.		۸ro	a(m²)		Λν Ηο	ight(m)		Volume(m	31
Ground floor			Aie		(1a) x		2.8	(2a) =	109.2	(3a)
Total floor area TFA = (1:	a)+(1b)+(1c)+(1d)+	(1⊝) ⊥ (1r	, <u> </u>		(4)]` ′		``
	a).(15).(15).(14).	(10)1(11	.,	39		77(30/7(30	d)+(3e)+	(3n) -		— ,,
Dwelling volume					(3a) + (3b) + (30)+(30	л) т (Зе)т	.(311) =	109.2	(5)
2. Ventilation rate:	main	secondar	'V	other		total			m³ per hou	ır
N	heating	heating	· 		, ,			40	_	
Number of chimneys	0 +	0	<u></u>	0	<u> </u>	0		40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	X :	20 =	0	(6b)
Number of intermittent fa	ns					2	X	10 =	20	(7a)
Number of passive vents	i					0	X	10 =	0	(7b)
Number of flueless gas fi	res				Ī	0	X ·	40 =	0	(7c)
					_					
					_		<u> </u>	Air cr	nanges per h	our —
Infiltration due to chimne					Ļ	20		÷ (5) =	0.18	(8)
If a pressurisation test has b Number of storeys in the		ended, procee	d to (17), (otherwise d	ontinue fi	rom (9) to	(16)		0	(9)
Additional infiltration	ne dwelling (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timb	er frame or	0.35 fo	r masonr	y consti	ruction			0	(11)
if both types of wall are p		rresponding to	the great	ter wall are	a (after					
deducting areas of opening for the deducting areas of opening for the deducting areas of opening areas of op	• / .	ealed) or 0	1 (coale	معام (امد	antar ()					7/12
If no draught lobby, en	,	•	. i (Scale	ou), cisc	enter o				0	(12)
Percentage of windows	•								0	(14
Window infiltration	g			0.25 - [0.2	x (14) ÷ 1	100] =			0	(15
Infiltration rate				(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16
Air permeability value,	q50, expressed in	cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	5	(17
lf based on air permeabil	ity value, then (18) =	= [(17) ÷ 20]+(B), otherw	ise (18) = (16)				0.43	(18
Air permeability value applie		has been dor	ne or a de	gree air pei	meability	is being u	sed			_
Number of sides sheltere Shelter factor	ed			(20) = 1 -	0 075 x (19)] =			2	(19)
Infiltration rate incorporat	ting shelter factor			(21) = (18)		10/] –			0.85	(20)
Infiltration rate modified f	-	eed.		(= :)	/				0.37	(21)
Jan Feb	Mar Apr Ma	1	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		7 50	I	<u>,a</u>		1	1		J	
$\frac{\text{(22)m}= \begin{array}{ c c c }\hline 5.1 & 5 \\ \hline \end{array}$	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
, , ,	1 1	1 3.3			•			<u> </u>	J	
Wind Factor (22a)m = (2	2)m ÷ 4								,	
	1.23 1.1 1.0	8 0.95	0.95		1	1.08	1.12			

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43]	
alculate effec		-	rate for t	he appli	cable ca	se		!				-	——, <u>,</u>
If mechanical If exhaust air he			andiv N (2	3h) - (23s	a) v Emy (e	auation (N	VSV) othe	rwica (23h) <i>- (</i> 23a)			0	(2
) = (23a)			0	(2
If balanced with		-	-	_					SI.) (001) [4 (00	0	(2
a) If balance							- ^ `-	ŕ	 		``) ÷ 100] 7	(2
4a)m= 0	0		0	0	0	0	0	0	0	0	0	_	(2
b) If balance							r Ó Ì	i `	<u> </u>	- 		1	(0
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	_	(2
c) If whole h if (22b)n				•	•				5 v (22h	,)			
4c)m = 0	0.5 x	0	0	0 = (231)	0	0	0 = (221)	0	0 × (231	0	0	1	(2
									0			_	(2
d) If natural if (22b)n									0.51				
4d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	1	(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	к (25)		l	<u> </u>	_	
5)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(2
. Heat losse												_	
LEMENT	Gros area		Openin		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-valu- kJ/m²-		A X k kJ/K
oo <mark>rs Type 1</mark>	aica	(111)			2.5	×	1.2	= [3		NO/111 -		(2
pors Type 2								=		Ħ			· ·
					2.5		1.2	= [3	H			(2
indows Type					0.78		/[1/(1.4)+	L	1.03	닉			
indows Type					1.5	_	/[1/(1.4)+	L	1.99	_			(2
indows Type	: 3 				2.47	x1.	/[1/(1.4)+ 	0.04] =	3.27	╝.			(2
alls	31.9)2	9.75		22.17	X	0.18	=	3.99				(:
otal area of e	lements	, m²			31.92	2							(;
or windows and						ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragrap	h 3.2	
include the area				is and par	titions		(26)(30)) ± (32) =					
bric heat los		•	U)				(20)(30)		(20) + (20	2) . (226)	(220)	16.2	
eat capacity		,		TEA):					.(30) + (32	, , ,	(32e) =	0	(;
nermal mass	•	•		,					tive Value		-1-1	250	(;
r design assess n be used inste				construct	ion are not	: known pr	ecisely the	e indicative	values of	TMP IN T	аріе 11		
nermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix k	<						1.6	(:
letails of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	11)								
otal fabric he	at loss							(33) +	(36) =			17.8	9 (
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 21.99	21.83	21.68	20.97	20.84	20.22	20.22	20.11	20.46	20.84	21.11	21.39]	(;
,			-		-			•		-	•	-	
eat transfer o	oefficie	nt, W/K						(39)m	= (37) + (3	38)m			

Heat Ic	ss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.02	1.02	1.01	1	0.99	0.98	0.98	0.97	0.98	0.99	1	1.01		
			/= .						,	Average =	Sum(40) ₁	12 /12=	1	(40)
Numbe	ı i		nth (Tab											
(44)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 \\/-	b o o t	:		luc no onte								14\A/b/10		
4. ۷۷	iler neal	ing ener	gy requi	rement.								kWh/yea	d۱.	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		38		(42)
Reduce	the annua	ıl average		usage by	5% if the a	welling is	designed t	(25 x N) to achieve		se target o		.98		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)			•			
(44)m=	73.67	70.99	68.31	65.64	62.96	60.28	60.28	62.96	65.64	68.31	70.99	73.67		
Enorgy	contont of	hot water	usod sol	culated ma	onthly - 1	100 v Vd r	n v nm v F	Tm / 3600			m(44) ₁₁₂ =		803.71	(44)
		95.56		85.97	82.49	71.18	65.96		76.59	89.26	97.43	105.81		
(45)m=	109.25	95.56	98.6	65.97	02.49	71.10	05.90	75.69			m(45) ₁₁₂ =	L	1053.78	(45)
If instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar – ou	111(40)112 -		1000.70	()
(46)m=	16.39	14.33	14.79	12.89	12.37	10.68	9.89	11.35	11.49	13.39	14.62	15.87		(46)
	storage		<i>/</i>		. \.									
		,						within sa	ame ves	sel		150		(47)
	-	_	nd no ta		•			(47) mbi boil	ers) ente	er 'O' in <i>(</i>	47)			
	storage		not wate	, (uno ii	1014400 1	notantai	10000 00	THE ECH	010) 01110) III (.,,			
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Tempe	rature fa	actor fro	m Table	2b							0.	54		(49)
٠.			storage					(48) x (49)) =		0.	75		(50)
,			eclared of factor fr	•										(51)
		_	ee secti		6 Z (KVV)	ii/iiti c /ua	iy <i>)</i>					0		(51)
	•	from Ta										0		(52)
Tempe	rature fa	actor fro	m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or (54) in (5	55)								0.	75		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Appendix	H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
	•				•		. ,	65 × (41)						
•							ı —	ng and a			- 			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
	1					- ` ` 			0	0	0	0]	(61)
	quired for	water he	eating ca	alculated	L for eac	h month	(62)n	0 = 0.8	85 × (45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 155.85	`	145.2	131.06	129.08	116.27	112.55	122.2		21.68	135.86	142.53	152.4]	(62)
Solar DHW input	t calculated	using App	endix G or	· Appendix	H (negat	ive quantity	y) (ente	r '0' if r	no solar	contribut	ion to wate	r heating)	ı	
(add addition														
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from v	water hea	ter				•	•				•	!	•	
(64)m= 155.85	137.64	145.2	131.06	129.08	116.27	112.55	122.2	28 12	21.68	135.86	142.53	152.4]	
	•					•		Output f	from wa	ater heate	r (annual) ₁	12	1602.4	(64)
Heat gains fro	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (6′	I)m] +	- 0.8 x	[(46)m	+ (57)m	+ (59)m	1]	
(65)m= 73.6	65.44	70.06	64.66	64.7	59.74	59.21	62.4	4 6	61.54	66.95	68.47	72.46]	(65)
include (57)m in calc	culation of	of (65)m	only if c	ylinder i	s in the	dwelli	ng or	hot wa	ater is f	rom com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a):										
Metabolic gai	ins (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g	Sep	Oct	Nov	Dec]	
(66)m= 69	69	69	69	69	69	69	69		69	69	69	69		(66)
Ligh <mark>ting g</mark> ains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Tal	ble 5					
(67)m= 11.15	9.9	8.05	6.1	4.56	3.85	4.16	5.4	7	7.25	9.21	10.75	11.46		(67)
App <mark>liance</mark> s g	ains (ca <mark>lc</mark>	ulated in	Append	dix L, eq	uation L	.13 or L1	3 a), a	lso se	e Tal	ole 5				
(68)m= 119.03	3 120.26	117.15	110.52	102.16	94.3	89.05	87.8	1 9	00.92	97.55	105.91	113.78		(68)
Cooking gain	s (calcula	ted in A	pendix	L, equat	ion L15	or L15a)), also	see	Table	5				
(69)m= 29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	9 2	29.9	29.9	29.9	29.9		(69)
Pumps and fa	ans gains	(Table 5	<u></u> ба)						•				•	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-		-		-	
(71)m= -55.2	-55.2	-55.2	-55.2	-55.2	-55.2	-55.2	-55.	2 -	55.2	-55.2	-55.2	-55.2]	(71)
Water heating	g gains (T	able 5)						•			•		•	
(72)m= 98.93	97.38	94.17	89.8	86.97	82.97	79.58	83.9	3 8	35.47	89.99	95.1	97.39		(72)
Total interna	ıl gains =				(66)m + (67)m	n + (68)	m + (6	9)m + (70)m + (7	(1)m + (72))m	•	
(73)m= 275.8	274.24	266.07	253.12	240.38	227.82	219.48	223.8	34 23	30.35	243.45	258.46	269.32]	(73)
6. Solar gair	ns:													
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	ations to	conve	ert to the	e applicat		tion.		
Orientation:			Area m²		Flu	ıx ble 6a		g_ Tob	_ le 6b	_	FF able 6c		Gains	
_	Table 6d				Га	Die ba		Tab	ie ob	_ '	able 60		(W)	7
East 0.9x		Х	1.5	5	X	19.64] x [0.	.63	x	0.7	=	3.51	(76)
East 0.9x		X	2.4	7	X ·	19.64	X	0.	.63	x	0.7	=	5.78	(76)
East 0.9x		X	1.	5	x ;	38.42] x [0.	.63	x	0.7	=	6.86	(76)
East 0.9x		Х	2.4	7	x :	38.42] x [0.	.63	x	0.7	=	11.3	(76)
East 0.9x	0.3	X	1.5	5	x (63.27	X	0.	.63	X	0.7	=	11.3	(76)

East	о о . Г					_			1		–		_		7(70)
	0.9x	0.3		X	2.47	×		53.27] X]	0.63	×	0.7	_ =	18.61	(76)
East	0.9x	0.3		X	1.5	ᆗ [×]	—	92.28] X]	0.63	×	0.7	╡ -	16.48	(76)
East	0.9x	0.3		X	2.47	→ ×		92.28] X]	0.63	_ ×	0.7	╡ -	27.14	(76)
East	0.9x	0.3		X	1.5	→ ×		13.09	X	0.63	×	0.7	=	20.2	(76)
East	0.9x	0.3		X	2.47	×	1	13.09	X	0.63	X	0.7	=	33.26	(76)
East	0.9x	0.3		X	1.5	×	1	15.77	X	0.63	X	0.7	=	20.68	(76)
East	0.9x	0.3		X	2.47	x	1	15.77	X	0.63	X	0.7	=	34.05	(76)
East	0.9x	0.3		X	1.5	×	1	10.22	Х	0.63	X	0.7	=	19.69	(76)
East	0.9x	0.3		X	2.47	X	1	10.22	X	0.63	X	0.7	=	32.42	(76)
East	0.9x	0.3		X	1.5	x	,	94.68	X	0.63	X	0.7	=	16.91	(76)
East	0.9x	0.3		X	2.47	X	9	94.68	X	0.63	X	0.7	=	27.84	(76)
East	0.9x	0.3		X	1.5	x	-	73.59	X	0.63	X	0.7	=	13.14	(76)
East	0.9x	0.3		X	2.47	×		73.59	x	0.63	X	0.7	=	21.64	(76)
East	0.9x	0.3		X	1.5	x		45.59	x	0.63	x	0.7	_ =	8.14	(76)
East	0.9x	0.3		X	2.47	x	-	45.59	х	0.63	x	0.7	=	13.41	(76)
East	0.9x	0.3		X	1.5	×		24.49	x	0.63	x	0.7		4.37	(76)
East	0.9x	0.3		X	2.47	x		24.49	x	0.63	×	0.7	_ =	7.2	(76)
East	0.9x	0.3		X	1.5	×		16.15	Х	0.63	Х	0.7		2.88	(76)
East	0.9x	0.3		X	2.47	₹ ×		16.15	X	0.63	X	0.7	= -	4.75	(76)
West	0.9x	0.77		X	0.78	×		19.64	i	0.63	X	0.7		4.68	(80)
West	0.9x	0.77		X	0.78		/—	38.42	X	0.63	X	0.7	=	9.16	(80)
West	0.9x	0.77		X	0.78	×		63.27	X	0.63	X	0.7	_	15.08	(80)
West	0.9x	0.77	7	X	0.78	\dashv $_{x}$	<u> </u>	92.28) X	0.63	X	0.7	= =	22	(80)
West	0.9x	0.77		X	0.78	×		13.09]]	0.63	X	0.7	= =	26.96	(80)
West	0.9x	0.77		X	0.78	=\ x		15.77]]	0.63	=	0.7	= =	27.6	(80)
West	0.9x	0.77		X	0.78	x	-	10.22] x	0.63	×	0.7	= =	26.27	(80)
West	0.9x	0.77	퓜	x	0.78	^_ x	_	94.68] ^] x	0.63	×	0.7	_ =	22.57	(80)
West	0.9x	0.77		x	0.78	^ ^	—	73.59] ^] x	0.63	^ x	0.7	_	17.54	(80)
West	0.9x			X		\dashv $\hat{\ }$] ^] x		$=$ $\frac{1}{x}$		= =		(80)
West	0.9x	0.77	=		0.78	=		15.59] 1	0.63	 	0.7	=	10.87	(80)
West	0.9x	0.77		X	0.78	x		24.49] x]	0.63	=	0.7	_ =	5.84	= '
WOSt	0.98	0.77		X	0.78	Х		16.15	Х	0.63	Х	0.7	=	3.85	(80)
Solora	oino in	wotto or	aloulo:	tod	for oach m	onth			(02)~	- Cum(74)m	(92)m				
(83)m=	13.97	27.32	44.9	-	for each me	.42	82.32	78.37	67.	s = Sum(74)m 32 52.33	32.42		11.48	1	(83)
` '					(84)m = (73)						1	1]	` '
Ţ	289.77	301.56	311.0	_	` 		310.14	297.86	291	.16 282.68	275.8	7 275.87	280.8]	(84)
L	on intor	nol tomp	orotu	ro /	haating oo	2000)			<u>l</u>	<u> </u>		<u> </u>			
					heating sea	ĺ	a oroo	from Tol	olo O	Th1 (°C)				04	(85)
-		•		•	eriods in the	•			ole 9	, IIII (C)				21	(65)
Otilisa		Feb		$\overline{}$	ving area, h			Jul	Ι	ug Sep	000	Nov	Doo	1	
(86)m=	Jan 0.99	0.99	Ma 0.98	_		/lay 89	Jun 0.73	0.55	0.5		Oct 0.96	+	Dec 1	1	(86)
L		<u> </u>						L		!	1 0.90	0.33	<u> </u>]	(00)
Г				_	ving area T			i –		i	00.55		00.00	1	(07)
(87)m=	20.07	20.16	20.3	4	20.59 20	.82	20.96	20.99	20.	99 20.92	20.66	20.33	20.06	J	(87)

_							_							
•			neating p				i					l		(00)
(88)m=	20.06	20.07	20.07	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.08	20.08		(88)
			ains for			· `	i							(0.0)
(89)m=	0.99	0.99	0.98	0.95	0.86	0.65	0.45	0.48	0.75	0.94	0.98	0.99		(89)
Mean	interna	temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.83	18.97	19.23	19.6	19.91	20.07	20.1	20.1	20.03	19.7	19.23	18.83		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.54	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.5	19.61	19.82	20.13	20.39	20.55	20.58	20.58	20.51	20.21	19.82	19.49		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.5	19.61	19.82	20.13	20.39	20.55	20.58	20.58	20.51	20.21	19.82	19.49		(93)
8. Spa	ace hea	ting requ	uirement											
			ternal ter or gains	•		ned at sto	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm			ļ.	ļ							
(94)m=	0.99	0.99	0.98	0.95	0.87	0.69	0.5	0.54	0.79	0.95	0.98	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m=	287.19	297.79	304.07	302.13	279	215.21	150.06	156.49	222.04	260.72	271.28	278.67		(95)
Mo <mark>nt</mark>	nly avera	age ex <mark>te</mark>	ernal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	los <mark>s rate</mark>	for me	an intern		erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	605.93	584.2	527.28	436.59	336.74	226.7	151.62	158.73	245.74	372.29	496.14	600.51		(97)
			ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻				
(98)m=	237.15	192.47	166.07	96.82	42.96	0	0	0	0	83	161.9	239.45		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1219.81	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								31.28	(99)
9a. En	ergy rec	uiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heatir	_			/I-							ı		¬(004)
	-		at from s			mentary	-	(222)	(55.1)				0	(201)
			at from m	•	` '			(202) = 1	, ,				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 – ((203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g systen	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heatin	g require	ement (c	alculate	d above)								
	237.15	192.47	166.07	96.82	42.96	0	0	0	0	83	161.9	239.45		
(211)m	n = {[(98)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
	253.63	205.85	177.61	103.55	45.94	0	0	0	0	88.77	173.16	256.09		
				-	-	-		Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}		1304.61	(211)
•		`	econdar	• , .	month							•		
$= \{[(98)]$		0 (1)] } X 1	00 ÷ (20	0	0	0	0	0	0	0	0	0		
(210)111-			<u> </u>	<u> </u>	<u> </u>	<u> </u>	l		l (kWh/yea				0	(215)
04	50 4 D 00 :	2 Varaion	40400	(OAD 0.05)					, ,,,,,,,	,(-	₹15,1012		Paga	

Water heating								
Output from water heater (calculated above) 155.85 137.64 145.2 131.06 129.08 1	16.27 112.55	122.28	121.68	135.86	142.53	152.4		
Efficiency of water heater							79.8	(216)
(217)m= 85.93 85.71 85.17 84.02 82.23	79.8 79.8	79.8	79.8	83.55	85.15	86.01		(217)
Fuel for water heating, kWh/month	-	-						
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 181.37 160.59 170.48 155.98 156.98 1	145.7 141.04	153.24	152.49	162.61	167.37	177.18		
		Tota	I I = Sum(2	19a) ₁₁₂ =			1925.03	(219)
Annual totals				k\	Wh/year	, ,	kWh/year	⊿ _
Space heating fuel used, main system 1							1304.61	
Water heating fuel used							1925.03	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							196.84	(232)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHF						
	Energy kWh/year			Emiss kg CO	ion fac	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2		=	281.8	(261)
Space heating (secondary)	(215) x			0.5		=	0](263)
Water heating	(219) x			0.2		=	415.81](264)
Space and water heating	(261) + (262)	+ (263) + ((264) =				697.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93] (267)
Electricity for lighting	(232) x			0.5	19	=	102.16	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		838.69	(272)
						,		_

TER =

(273)

31.34

		User [Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	Droporty	Strom Softwa	are Ve	rsion:		Versio	on: 1.0.4.26	
Address :		Property	Address	. D44_D	e Green				
1. Overall dwelling dime	ensions:								
0 10			a(m²)	1	Av. He	ight(m)	٦	Volume(m	<u> </u>
Ground floor			75.7	(1a) x	2	2.8	(2a) =	211.96	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	75.7	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	211.96	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	= [0	X	40 =	0	(6a)
Number of open flues	0 + 0	= + F	0	_ = [0	X	20 =	0	(6b)
Number of intermittent fa	ns				0	x	10 =	0	(7a)
Number of passive vents				F	0	x	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X	40 =	0	(7c)
								nanges per ho	our
	ys, flues and fans = (6a)+(6b)+ een carried out or is intended, proce			continuo fi	0 (0) to		\div (5) =	0	(8)
Number of storeys in the		eu 10 (17),	ourerwise (continue ii	OIII (9) 10 ((10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame of	or 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are pu deducting areas of openin	resent, use the value corresponding	to the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic met	•	•	•	etre of e	envelope	area	3	(17)
•	ity value, then $(18) = [(17) \div 20]$ es if a pressurisation test has been d				is heina u	sed		0.15	(18)
Number of sides sheltere		one or a de	gree an pe	meability	is being u	3CU		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified f	or monthly wind speed								•
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	eed from Table 7							-	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (2	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
, ,	1 1 3.00		L	L			<u> </u>	1	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		_	rate for t	he appli	cable ca	se	l					, 	
If mechanica				al.) (aa		(1	.=	. (00)	\			0.5	(23a
If exhaust air he) = (23a)			0.5	(23h
If balanced with		-	-	_								76.5	(230
a) If balance						- ` 	- ` ` - 	í `	r ´ `		- ` '	÷ 100]	.
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	J	(248
b) If balance		1					r ``	í `	r Ó - Ò	- 	1	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24)
c) If whole h if (22b)n				•					.5 × (23b	o)	_	_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)m				•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25
3. Heat losse	s and he	eat loss r	naramete	or.						_	_	_	_
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Doo <mark>rs</mark>					2.5	x	1.3	=	3.25				(26
Vin <mark>dows</mark> Type	1				2.4	x1.	/[1/(1.3)+	0.04] =	2.97	Ħ			(27
Windows Type	2				2.6	x1.	/[1/(1.3)+	0.04] =	3.21	Ħ			(27
Vindows Type	3				2.6	x1.	/[1/(1.3)+	0.04] =	3.21	5			(27
Vindows Type	4				2.6	x1.	/[1/(1.3)+	0.04] =	3.21				(27
Vindows Type	5				2.6	x ₁ ,	/[1/(1.3)+	0.04] =	3.21	=			(27
Walls Type1	45.9	12	23.1		22.82	<u> </u>	0.15		3.42	=			(29
Valls Type2	20.1		0	=	20.16	=	0.14		2.85	=		╡┝	(29
otal area of e					66.08	=	0.11		2.00				(31
for windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	as aiven in	paragrapl	1 3.2	(01
* include the area								,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	3	, ,		
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				34.98	(33
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a)	(32e) =	0	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
or design assess an be used instea				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						3.3	(36
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			38.29	(37
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 19.59	19.37	19.14	18.03	17.81	16.69	16.69	16.47	17.14	17.81	18.25	18.7]	(38
Heat transfer o	coefficie	nt, W/K			•	•	•	(39)m	= (37) + (37)	38)m	•	•	
39)m= 57.88	57.65	57.43	56.32	56.09	54.98	54.98	54.76	55.42	56.09	56.54	56.98]	
	2 Version	. 1 0 4 26 /	(SAD 0 02)	http://wn	ww.stroma	com			Average =	Sum(39) ₁	12 /12=	56.26	age 2 of 38

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.76	0.76	0.76	0.74	0.74	0.73	0.73	0.72	0.73	0.74	0.75	0.75		
							ı	,	Average =	Sum(40) ₁	12 /12=	0.74	(40)
Number of day	/s in mo	nth (Tab	le 1a)			1		1		•			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		38		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed i			se target o		.64		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage is	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	!		•			
(44)m= 99.7	96.07	92.45	88.82	85.2	81.57	81.57	85.2	88.82	92.45	96.07	99.7		
		•				•				m(44) ₁₁₂ =		1087.62	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,ı	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 147.85	129.31	133.44	116.33	111.62	96.32	89.26	102.43	103.65	120.79	131.85	143.18		_
If instantaneous w	vater heati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =		1426.04	(45)
	_			-		_			40.40	40.70	04.40		(46)
(46)m= 22.18 Water storage	19.4 loss:	20.02	17.45	16.74	14.45	13.39	15.36	15.55	18.12	19.78	21.48		(40)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufact				or is kno	wn (kVVI	n/day):				1.	63		(48)
Temperature f										0	.6		(49)
Energy lost fro b) If manufact		_	-		or io not		(48) x (49)) =		0.	98		(50)
Hot water stor			-								0		(51)
If community h	-			- (7)					<u> </u>		(- /
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (55)								0.	98		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit	,	•			59)m =	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wa	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loso	a a la ulata d	for oach	month /	(64)m	(CO) + 2(GE (41)	١,,,,						
Combi loss (61) m= 0	Dalculated 0	o each	0	0	00) - 30	05 × (41)	0	0	0	0	0]	(61)
(*)							<u> </u>	ļ	<u> </u>	ļ	<u> </u>	(50)m + (61)m	(01)
(62)m= 201.4	-i	187.02	168.19	165.21	148.18	142.84	156.01	155.5	174.37	183.71	196.77	(59)m + (61)m	(62)
Solar DHW inpu						<u> </u>							(02)
(add addition									ii ooniinba	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter				<u> </u>	l	<u> </u>	<u>!</u>	ļ	<u> </u>		
(64)m= 201.4		187.02	168.19	165.21	148.18	142.84	156.01	155.5	174.37	183.71	196.77		
							Out	put from w	ater heate	r (annual)₁	l12	2056.91	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 92.02	2 81.71	87.23	80.16	79.98	73.51	72.54	76.92	75.94	83.03	85.32	90.47		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):								-	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts													
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 118.8	1 118.81	118.81	118.81	118.81	118.81	118.81	118.81	118.81	118.81	118.81	118.81		(66)
Ligh <mark>ting g</mark> air	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 18.74	4 16.65	13.54	10.25	7.66	6.47	6.99	9.08	12.19	15.48	18.07	19.26		(67)
Appliances (gains (ca <mark>lc</mark>	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m= 210.2	212.4	206.9	195.2	180.43	166.54	157.27	155.09	160.58	172.29	187.06	200.94		(68)
Cooking gair	ns (calcula	ited in A	opendix	L, equat	ion L15	or L15a)), also s	ee Table	5		-		
(69)m= 34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.88		(69)
Pumps and	fans gains	(Table 5	āa)										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)							_	
(71)m= -95.0	5 -95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05		(71)
Water heating	ng gains (1	Table 5)										-	
(72)m= 123.6	9 121.6	117.25	111.34	107.5	102.1	97.5	103.39	105.48	111.6	118.5	121.6		(72)
Total intern	al gains =	•			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m		
(73)m= 411.2	9 409.29	396.33	375.43	354.23	333.75	320.4	326.2	336.9	358.01	382.28	400.45		(73)
6. Solar gai	ins:												
Solar gains ar		•					itions to co	onvert to th	ne applical		tion.		
Orientation:	Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)												
N. d.							, —		_ '			(W)	1
Northeast 0.9		Х	2.4			11.28	X	0.53	x	0.7	=	2.71	(75)
Northeast 0.9		Х	2.0	===		11.28	x	0.53	x	0.7	=	2.94	(75)
Northeast 0.9	0.0	X	2.4			22.97	x	0.53	x	0.7	=	5.52	(75)
Northeast 0.9		X	2.0		<u> </u>	22.97	x	0.53	x	0.7	=	5.98	(75)
Northeast 0.9	x 0.3	X	2.	4	X 4	11.38	Х	0.53	X	0.7	=	9.95	(75)

				1								_
Northeast _{0.9x}	0.3	X	2.6	X	41.38	X	0.53	X	0.7	=	10.78	(75)
Northeast _{0.9x}	0.3	X	2.4	X	67.96	X	0.53	X	0.7	=	16.34	(75)
Northeast _{0.9x}	0.3	х	2.6	X	67.96	X	0.53	X	0.7	=	17.7	(75)
Northeast _{0.9x}	0.3	X	2.4	X	91.35	X	0.53	X	0.7	=	21.96	(75)
Northeast _{0.9x}	0.3	X	2.6	X	91.35	X	0.53	X	0.7	=	23.79	(75)
Northeast _{0.9x}	0.3	x	2.4	X	97.38	X	0.53	X	0.7	=	23.41	(75)
Northeast 0.9x	0.3	X	2.6	x	97.38	x	0.53	x	0.7	=	25.36	(75)
Northeast _{0.9x}	0.3	X	2.4	X	91.1	x	0.53	x	0.7	=	21.9	(75)
Northeast _{0.9x}	0.3	X	2.6	X	91.1	x	0.53	x	0.7	=	23.73	(75)
Northeast 0.9x	0.3	X	2.4	x	72.63	x	0.53	x	0.7	=	17.46	(75)
Northeast _{0.9x}	0.3	x	2.6	x	72.63	x	0.53	x	0.7	=	18.92	(75)
Northeast _{0.9x}	0.3	x	2.4	x	50.42	x	0.53	x	0.7	=	12.12	(75)
Northeast _{0.9x}	0.3	x	2.6	х	50.42	x	0.53	x	0.7	=	13.13	(75)
Northeast _{0.9x}	0.3	x	2.4	х	28.07	x	0.53	x	0.7	=	6.75	(75)
Northeast _{0.9x}	0.3	x	2.6	x	28.07	x	0.53	x	0.7	=	7.31	(75)
Northeast _{0.9x}	0.3	x	2.4	х	14.2	x	0.53	x	0.7	=	3.41	(75)
Northeast _{0.9x}	0.3	x	2.6	х	14.2	x	0.53	x	0.7	=	3.7	(75)
Northeast _{0.9x}	0.3	X	2.4	X	9.21	Х	0.53	X	0.7	=	2.22	(75)
Northeast _{0.9x}	0.3	x	2.6	x	9.21	x	0.53	x	0.7	=	2.4	(75)
East 0.9x	0.77	x	2.6	х	19.64	x	0.53	x	0.7	=	26.26	(76)
East 0.9x	0.77	x	2.6	x	19.64	x	0.53	x	0.7	=	26.26	(76)
East 0.9x	0.77	x	2.6	х	19.64	Х	0.53	x	0.7	=	26.26	(76)
East 0.9x	0.77	x	2.6	x	38.42	X	0.53	x	0.7	=	51.37	(76)
East 0.9x	0.77	x	2.6	х	38.42	x	0.53	x	0.7	=	51.37	(76)
East 0.9x	0.77	x	2.6	x	38.42	x	0.53	x	0.7	=	51.37	(76)
East 0.9x	0.77	X	2.6	X	63.27	X	0.53	x	0.7	=	84.59	(76)
East 0.9x	0.77	X	2.6	X	63.27	x	0.53	x	0.7	=	84.59	(76)
East 0.9x	0.77	X	2.6	x	63.27	x	0.53	x	0.7	=	84.59	(76)
East 0.9x	0.77	X	2.6	X	92.28	x	0.53	x	0.7	=	123.37	(76)
East 0.9x	0.77	X	2.6	X	92.28	x	0.53	x	0.7	=	123.37	(76)
East 0.9x	0.77	X	2.6	X	92.28	x	0.53	x	0.7	=	123.37	(76)
East 0.9x	0.77	X	2.6	X	113.09	x	0.53	x	0.7	=	151.2	(76)
East 0.9x	0.77	X	2.6	X	113.09	x	0.53	x	0.7	=	151.2	(76)
East 0.9x	0.77	x	2.6	x	113.09	x	0.53	x	0.7	=	151.2	(76)
East 0.9x	0.77	x	2.6	x	115.77	x	0.53	x	0.7	=	154.78	(76)
East 0.9x	0.77	x	2.6	x	115.77	x	0.53	x	0.7	=	154.78	(76)
East 0.9x	0.77	x	2.6	x	115.77	x	0.53	x	0.7	=	154.78	(76)
East 0.9x	0.77	x	2.6	x	110.22	x	0.53	x	0.7	=	147.35	(76)
East 0.9x	0.77	x	2.6	x	110.22	x	0.53	x	0.7	=	147.35	(76)
East 0.9x	0.77	x	2.6	x	110.22	x	0.53	x	0.7	=	147.35	(76)
East 0.9x	0.77	X	2.6	x	94.68	x	0.53	X	0.7	=	126.58	(76)

East	0.9x	0.77	X	2.6	X		94.68	x	0.53	x	0.7	=	126.58	(76)													
East	0.9x	0.77	X	2.6	X	9	94.68	x	0.53	x	0.7	=	126.58	(76)													
East	0.9x	0.77	X	2.6	X	7	'3.59	х	0.53	x	0.7	=	98.38	(76)													
East	0.9x	0.77	X	2.6	х	7	'3.59	x	0.53	x	0.7	=	98.38	(76)													
East	0.9x	0.77	X	2.6	х	7	'3.59	x	0.53	x	0.7	=	98.38	(76)													
East	0.9x	0.77	X	2.6	X	4	5.59	x	0.53	x	0.7	=	60.95	(76)													
East	0.9x	0.77	X	2.6	X	4	5.59	x	0.53	x	0.7	=	60.95	(76)													
East	0.9x	0.77	x	2.6	X	. 4	5.59	x	0.53	x	0.7	=	60.95	(76)													
East	0.9x	0.77	x	2.6	X	2	24.49	x	0.53	x	0.7		32.74	(76)													
East	0.9x	0.77	X	2.6	X	2	24.49	x	0.53	x	0.7	=	32.74	(76)													
East	0.9x	0.77	x	2.6	x	2	24.49	x	0.53	x	0.7	_ =	32.74	(76)													
East	0.9x	0.77	х	2.6	X	1	6.15	x	0.53	x	0.7		21.59	(76)													
East	0.9x	0.77	X	2.6	x	1	6.15	x	0.53	x	0.7	=	21.59	(76)													
East	0.9x	0.77	x	2.6	x	1	6.15	x	0.53	x	0.7	_ =	21.59	(76)													
			_																								
Solar g	ains in	watts, calcu	lated	for each	month			(83)m = 3	Sum(74)m .	(82)m																	
(83)m=	84.42	165.6 27	4.5	404.15	499.34	513.11	487.69	416.1	320.41	196.91	105.33	69.39		(83)													
Total g	ains – i	nternal and	solar	(84)m = ((73)m +	(83)m	, watts						•														
Total gains – internal and solar (84) m = (73) m + (83) m , watts (84) m = 495.72 574.89 670.83 779.58 853.58 846.86 808.1 742.3 657.3 554.92 487.61 469.85 (84)																											
7. Mea	an inter	nal tempera	ture (heating s	season)																						
						area	from Tak	ole 9. Ti	h1 (°C)				21	(85)													
		-				_								``													
[9	.,,	,000.0								Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) (85)													
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec																											
														(86)													
(86)m=	1	0.99 0.	95	0.81	0.6	0.42	0.3	ļ	0.58	_				(86)													
Mean	1 interna	0.99 0.	95 e in li	0.81	0.6 a T1 (fol	0.42 low ste	0.3 ps 3 to 7	0.34 ' in Tab	0.58 le 9c)	0.9	0.99	1		, ,													
Mean (87)m=	interna 20.37	0.99 0. I temperatur 20.52 20	95 e in li	0.81 iving area 20.94	0.6 a T1 (foll 20.99	0.42 low ste	0.3 ps 3 to 7	0.34 7 in Tab 21	0.58 lle 9c)	_	0.99			(86) (87)													
Mean (87)m= Tempe	interna 20.37 erature	0.99 0. I temperatur 20.52 20 during heati	95 e in li .74 ing pe	0.81 iving area 20.94 eriods in 1	0.6 a T1 (foll 20.99	0.42 low ste	0.3 ps 3 to 7 21 from Ta	0.34 7 in Tab 21 able 9, 7	0.58 le 9c) 21 Th2 (°C)	20.89	0.99	20.35		(87)													
Mean (87)m=	interna 20.37	0.99 0. I temperatur 20.52 20 during heati	95 e in li	0.81 iving area 20.94	0.6 a T1 (foll 20.99	0.42 low ste	0.3 ps 3 to 7	0.34 7 in Tab 21	0.58 lle 9c)	0.9	0.99	1		, ,													
Mean (87)m= [Tempo (88)m= [interna 20.37 erature 20.28	0.99 0. I temperatur 20.52 20 during heati 20.29 20 etor for gains	e in li .74 ing pe .29	0.81 iving area 20.94 eriods in 1 20.3 est of dw	0.6 a T1 (foll 20.99 rest of d 20.3 relling, h.	0.42 low ste 21 welling 20.32 2,m (se	ps 3 to 7 21 from Ta 20.32 ee Table	0.34 7 in Tab 21 able 9, 7 20.32	0.58 lle 9c) 21 Th2 (°C) 20.31	20.89	20.59	20.35		(87)													
Mean (87)m= [Tempo (88)m= [interna 20.37 erature 20.28	0.99 0. I temperatur 20.52 20 during heati 20.29 20 etor for gains	95 e in li 1.74 ing pe	0.81 iving area 20.94 eriods in 1 20.3	0.6 a T1 (fol 20.99 rest of d 20.3	0.42 low ste 21 welling 20.32	0.3 ps 3 to 7 21 from Ta 20.32	0.34 7 in Tab 21 able 9, 7 20.32	0.58 le 9c) 21 Th2 (°C)	20.89	0.99	20.35]]]	(87)													
Mean (87)m= [Tempo (88)m= [Utilisa (89)m= [interna 20.37 erature 20.28 ation fac 0.99	0.99 0. I temperatur 20.52 20 during heati 20.29 20 etor for gains	95 re in li	0.81 iving area 20.94 eriods in I 20.3 est of dw 0.78	0.6 a T1 (folication of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content	0.42 low ster 21 welling 20.32 2,m (se 0.37	0.3 ps 3 to 7 21 from Ta 20.32 ee Table 0.25	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29	0.58 lle 9c) 21 Th2 (°C) 20.31	20.89 20.3 0.87	20.59	20.35		(87)													
Mean (87)m= [Tempo (88)m= [Utilisa (89)m= [interna 20.37 erature 20.28 ation fac 0.99	0.99 0. I temperatur 20.52 20 during heati 20.29 20 etor for gains 0.98 0. I temperatur	95 re in li	0.81 iving area 20.94 eriods in I 20.3 est of dw 0.78	0.6 a T1 (folication of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content	0.42 low ster 21 welling 20.32 2,m (se 0.37	0.3 ps 3 to 7 21 from Ta 20.32 ee Table 0.25	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29	0.58 lle 9c) 21 Th2 (°C) 20.31	20.89 20.3 0.87	20.59	20.35		(87)													
Mean (87)m= Tempo (88)m= Utilisa (89)m= Mean	interna 20.37 erature 20.28 ation fac 0.99 interna	0.99 0. I temperatur 20.52 20 during heati 20.29 20 etor for gains 0.98 0. I temperatur	e in ling per 1.29 for re 94 re in t	0.81 iving area 20.94 eriods in 1 20.3 est of dw 0.78 he rest of	0.6 a T1 (foll 20.99 rest of d 20.3 relling, h: 0.56 f dwellin	0.42 low ste 21 welling 20.32 2,m (se 0.37 g T2 (f	ps 3 to 7 21 from Ta 20.32 ee Table 0.25 ollow ste	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52 7 in Tabl 20.31	20.89 20.3 0.87 e 9c) 20.18	0.99 20.59 20.3	1 20.35 20.29 1 19.41	0.38	(87) (88) (89)													
Mean (87)m= [Tempe (88)m= [Utilisa (89)m= [Mean (90)m= [interna 20.37 erature 20.28 ation fac 0.99 interna 19.44	0.99 0. I temperatur 20.52 20 during heati 20.29 20 etor for gains 0.98 0. I temperatur 19.66 19	e in li .74 ing pe .29 s for ro 94 e in t	o.81 iving area 20.94 eriods in 1 20.3 est of dw 0.78 he rest of	0.6 a T1 (fol 20.99 rest of d 20.3 relling, h: 0.56 f dwellin 20.3	0.42 low ste 21 welling 20.32 2,m (se 0.37 g T2 (fi 20.32	0.3 ps 3 to 7 21 from Ta 20.32 ee Table 0.25 ollow ste 20.32	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52 7 in Tabl 20.31	20.89 20.3 0.87 e 9c) 20.18	0.99 20.59 20.3 0.98	1 20.35 20.29 1 19.41	0.38	(87) (88) (89) (90)													
Mean (87)m= Tempo (88)m= Utilisa (89)m= Mean (90)m= Mean	interna 20.37 erature 20.28 ation fac 0.99 interna 19.44	0.99 0. I temperatur 20.52 20 during heati 20.29 20 ctor for gains 0.98 0. I temperatur 19.66 19 I temperatur	e in li .74 ing pe .29 for re 94 e in t	0.81 iving area 20.94 eriods in 1 20.3 est of dw 0.78 he rest of 20.23	o.6 a T1 (foll 20.99 rest of d 20.3 relling, h: 0.56 f dwellin 20.3	0.42 low stern 21 welling 20.32 2,m (sern 0.37) g T2 (fr 20.32)	0.3 ps 3 to 7 21 from Ta 20.32 ee Table 0.25 ollow ste 20.32 LA × T1	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52 7 in Tabl 20.31 f LA) x T2	20.89 20.3 0.87 e 9c) 20.18 LA = Liv	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4	1 20.35 20.29 1 19.41	0.38	(87) (88) (89) (90)													
Mean (87)m= [Tempo (88)m= [Utilisa (89)m= [Mean (90)m= [Mean (92)m= [interna 20.37 erature 20.28 ation fac 0.99 interna 19.44 interna 19.79	0.99 0. I temperatur 20.52 20 during heati 20.29 20 etor for gains 0.98 0. I temperatur 19.66 19 I temperatur 19.98 20	95 e in li 1.74 ing pe 1.29 s for re 1.97 e in t 1.97 e (for	o.81 iving area 20.94 eriods in 1 20.3 est of dwo 0.78 he rest of 20.23 the whole 20.5	0.6 a T1 (folication 20.99 rest of d 20.3 relling, h 0.56 f dwellin 20.3	0.42 low steres 21 welling 20.32 2,m (see 0.37 g T2 (fr 20.32	0.3 ps 3 to 7 21 from Ta 20.32 ee Table 0.25 ollow ste 20.32 LA × T1 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52 7 in Tabl 20.31 f LA) × T2 20.57	20.89 20.3 0.87 e 9c) 20.18 LA = Liv	0.99 20.59 20.3 0.98	1 20.35 20.29 1 19.41	0.38	(87) (88) (89) (90) (91)													
Mean (87)m= [Tempo (88)m= [Utilisa (89)m= [Mean (90)m= [Mean (92)m= [interna 20.37 erature 20.28 ation fac 0.99 interna 19.44 interna 19.79	0.99 0. I temperatur 20.52 20 during heati 20.29 20 ctor for gains 0.98 0. I temperatur 19.66 19 I temperatur 19.98 20 nent to the n	95 e in li 1.74 ing pe 1.29 s for re 1.97 e in t 1.97 e (for	0.81 iving area 20.94 eriods in 1 20.3 est of dw 0.78 he rest of 20.23 the whole 20.5 internal t	0.6 a T1 (folication 20.99 rest of d 20.3 relling, h 0.56 f dwellin 20.3	0.42 low steres 21 welling 20.32 2,m (see 0.37 g T2 (fr 20.32	0.3 ps 3 to 7 21 from Ta 20.32 ee Table 0.25 ollow ste 20.32 LA × T1 20.57	0.34 7 in Tab 21 able 9, 7 20.32 9a) 0.29 eps 3 to 20.32 + (1 - f	0.58 lle 9c) 21 Th2 (°C) 20.31 0.52 7 in Tabl 20.31 f LA) × T2 20.57	20.89 20.3 0.87 e 9c) 20.18 LA = Liv	0.99 20.59 20.3 0.98 19.78 ing area ÷ (4	1 20.35 20.29 1 19.41	0.38	(87) (88) (89) (90) (91)													
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Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 492.3 564.09 627.72 614.65 492.79 328.27 218.5 228.64 356.55 486.54 478.68 467.48		(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		
(97)m= 896.47 869.5 790.16 653.13 496.95 328.45 218.51 228.67 358.48 552.44 734.08 886.98		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m		
(98)m= 300.7 205.23 120.86 27.71 3.1 0 0 0 0 49.03 183.88 312.11	4000.00	(98)
Total per year (kWh/year) = Sum(98) _{15,912} = Space heating requirement in kWh/m²/year	1202.62	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.		_
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	e latter	
Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.25	(306)
Space heating	kWh/year	_
Annual space heating requirement	1202.62	
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1503.27	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating _		_
Annual water heating requirement	2056.91	
If DHW from community scheme: Water heat from Community heat pump (64) × (303a) × (305) × (306) =	2571.14	(310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = \begin{bmatrix} 0.01 \times [(307a)(307e) + (310a)(310e)] \end{bmatrix}$	40.74	(313)
Cooling System Energy Efficiency Ratio	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	197.18	(330a)
warm air heating system fans	0	(330b)
pump for solar water heating	0	(330g)
Total electricity for the above, kWh/year $=(330a) + (330b) + (330g) =$	197.18	(331)
Energy for lighting (calculated in Appendix L)	330.98	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-494.01	
Libertony generated by 1 ve (Appendix W) (negative quantity)		

Electricity generated by wind turbine (Appendix M) (negative quantity) (334)12b. CO2 Emissions – Community heating scheme Energy **Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) 319 (367a) CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$ 662.89 (367)0.52 Electrical energy for heat distribution (372)[(313) x]0.52 21.15 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)684.04 CO2 associated with space heating (secondary) (309) x(374)0 0 CO2 associated with water from immersion heater or instantaneous heater (312) x (375)0.52 0 Total CO2 associated with space and water heating (373) + (374) + (375) =684.04 (376)CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 102.33 CO2 associated with electricity for lighting (332))) x (379)0.52 171.78 Energy saving/generation technologies (333) to (334) as applicable Item 1 x = 0.01 =(380) 0.52 -256.39 sum of (376)...(382) = Total CO2, kg/year (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)9.27 El rating (section 14) (385)92.21

			User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 20)12		Strom Softwa				Versio	on: 1.0.4.26	
		Р	roperty	Address	: B44_B	e Green				
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor				a(m²) 75.7	(1a) x		2.8	(2a) =	Volume(m ²	3) (3a
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	le)+(1r	۱)	75.7	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	211.96	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	y □ + □	other 0	7 = F	total 0	x	40 =	m³ per hou	ır
Number of open flues			」]			20 =		=
•		0	J ' L	0	J -	0			0	(6t
Number of intermittent fan	IS				Ĺ	3		10 =	30	(7a
Number of passive vents					L	0	X	10 =	0	(7b
Number of flueless gas fire	es					0	X	40 =	0	(70
								Air ch	nanges per he	our
Infiltration due to chimney	s flues and fans –	(6a)+(6b)+(7	′a)+(7h)+((7c) =	Г	00				(8)
If a pressurisation test has be					continue f	30 rom (9) to		÷ (5) =	0.14	(0)
Number of storeys in the									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11
if both types of wall are pre deducting areas of opening		esponding to	the grea	ter wall are	a (after					
If suspended wooden flo		aled) or 0	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, ente	er 0.05, else enter 0								0	(13
Percentage of windows	and doors draught	stripped							0	(14
Window infiltration				0.25 - [0.2	. ,	-			0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value, o	•		•	•	•	netre of e	envelope	area	5	(17
If based on air permeabilit Air permeability value applies						is heina u	sed		0.39	(18
Number of sides sheltered		ao 20071 ao	io oi a ao,	groo an po	modelinty	io zomig u	ood		2	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporation	ng shelter factor			(21) = (18) x (20) =				0.33	(21
Infiltration rate modified fo	r monthly wind spee	ed								
Jan Feb I	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a\m = (22										
Wind Factor (22a)m = (22 $(22a)$ m = 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
(1			1 3.02	<u> </u>	1	12		l	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.42	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39]	
Calculate effec	ctive air	change i	rate for t	he appli	cable ca	se	ļ	!	!	!	!	J 	
If mechanica												0	(23
If exhaust air h) = (23a)			0	(23)
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(230
a) If balance	d mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m = 0	0	0	0	0	0	0	0	0	0	0	0]	(24a
b) If balance	d mech	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		,	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24)
c) If whole h if (22b)n				•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24)
d) If natural if (22b)n				•	•				0.5]				
(24d)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58]	(240
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)	•	•	•		
(25)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
3. Heat losse	e and he	at lose r	naram o t	or:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Doors					2.5	x	1.2	=	3				(26)
Win <mark>dows</mark> Type	1				1.91	x1,	/[1/(1.4)+	0.04] =	2.53	Ħ			(27)
Windows Type	2				2.07	x1,	/[1/(1.4)+	0.04] =	2.74	Ħ			(27)
Windows Type	3				2.07	x1,	/[1/(1.4)+	0.04] =	2.74	5			(27)
Windows Type	e 4				2.07		/[1/(1.4)+	0.04] =	2.74	一			(27)
Windows Type	e 5				2.07	=	/[1/(1.4)+	0.04] =	2.74	=			(27)
Walls Type1	45.9	12	18.9		27.02	=	0.18		4.86	=		¬ г	(29)
Walls Type2	20.1		0		20.16	_	0.18		3.63	북 ¦		륏 누	(29)
Total area of e						=	0.10		3.03				(31)
* for windows and			effective wi	ndow H-va	66.08		ı formula 1	/[(1/LI-valu	ıe)+0 041 a	as aiven in	naragranl	132	(31)
** include the area						a.ca a.cg		, [(.0, .0.0 ., 0	g.v. c	pa.ag.ap.	. 0.2	
Fabric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				33.2	23 (33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste				constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						3.3	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			36.5	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 41.27	41.03	40.79	39.66	39.45	38.47	38.47	38.29	38.85	39.45	39.88	40.32		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 77.81	77.57	77.33	76.2	75.99	75.01	75.01	74.83	75.39	75.99	76.42	76.86		
Stroma FSAP 201	2 Version:	1.0.4.26 (SAP 9.92)	- http://w\	ww.stroma	.com			Average =	Sum(39) ₁	12 /12=	76.	Page 2 (38)

Heat loss para	ımeter (l	HLP). W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.03	1.02	1.02	1.01	1	0.99	0.99	0.99	1	1	1.01	1.02		
	ļ			ļ		<u> </u>	ļ		L Average =	Sum(40) ₁	12 /12=	1.01	(40)
Number of day	/s in mo	nth (Tab	le 1a)									1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		38		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		.64		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	!	!	•			
(44)m= 99.7	96.07	92.45	88.82	85.2	81.57	81.57	85.2	88.82	92.45	96.07	99.7		
		•				•				m(44) ₁₁₂ =		1087.62	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,ı	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 147.85	129.31	133.44	116.33	111.62	96.32	89.26	102.43	103.65	120.79	131.85	143.18		_
If instantaneous w	vater heati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =		1426.04	(45)
	_					_			40.40	40.70	04.40		(46)
(46)m= 22.18 Water storage	19.4 loss:	20.02	17.45	16.74	14.45	13.39	15.36	15.55	18.12	19.78	21.48		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage											,		
a) If manufact				or is kno	wn (kWl	n/day):				1.	39		(48)
Temperature f										0.	54		(49)
Energy lost fro		•	•		!4		(48) x (49)) =		0.	75		(50)
b) If manufactHot water stora			-								0		(51)
If community h	-			.0 2 (, ,	~ 3 /					O		(01)
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (55)								0.	75		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m =	(58) ÷ 36	65 × (41)	m					
(modified by		rom Tab	le H5 if t	here is s	solar wa	ter heati	ng and a	cylinde	r thermo	stat)	· · · · · ·		
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calc	culated t	for each	month ((61)m =	(60) ÷	365 × (41)m							
(61)m= 0	0	0	0	0	0	0))	0	0	0	0]	(61)
Total heat requi	ired for	water he	eating ca	alculated	l for ea	 ch month	(62)	—— m =	0.85 × ((45)m +	(46)m +	(57)m +	י - (59)m + (61)m	
(62)m= 194.45	171.4	180.03	161.43	158.22	141.42		149	_	148.74	167.39	176.95	189.78	1	(62)
Solar DHW input ca	alculated u	using App	endix G oı	· Appendix	H (nega	tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	<u>.</u>	
(add additional	lines if I	FGHRS	and/or \	VWHRS	applie	s, see Ap	pend	dix G	3)					
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0		(63)
Output from wat	ter heat	er											_	
(64)m= 194.45	171.4	180.03	161.43	158.22	141.42	135.85	149	.02	148.74	167.39	176.95	189.78		_
								Outp	out from wa	ater heate	er (annual)	112	1974.66	(64)
Heat gains from	water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	1 + (6	1)m] + 0.8 x	([(46)m	+ (57)m	+ (59)m	ຼ]	
(65)m= 86.44	76.66	81.64	74.75	74.39	68.1	66.95	71.	33	70.54	77.44	79.91	84.88]	(65)
include (57)m	n in calc	ulation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal gain	ns (see	Table 5	and 5a):										
Metabolic gains	(Table	5), Wat	ts			_	_			_			_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec]	
(66)m= 118.81	118.81	118.81	118.81	118.81	118.81	118.81	118	.81	118.81	118.81	118.81	118.81		(66)
Lighting gains (calculat	ed in Ap	pendix	L, equat	ion L9	or L9a), <mark>a</mark>	lso s	ee	Table 5					
(67)m= 18.75	16.66	13.55	10.25	7.67	6.47	6.99	9.0	9	12.2	15.49	18.08	19.27		(67)
App <mark>liance</mark> s gain	ns (ca <mark>lcı</mark>	ulated in	Append	dix L, eq	uation	L13 or L1	<mark>3</mark> a),	also	see Tal	ble 5				
(68)m= 210.22	212.4	206.9	195.2	180.43	166.54	157.27	155	.09	160.58	172.29	187.06	200.94		(68)
Cooking gains ((calcula	ted in A	pendix	L, equat	ion L1	5 or L15a), als	o se	e Table	5				
(69)m= 34.88	34.88	34.88	34.88	34.88	34.88	34.88	34.	88	34.88	34.88	34.88	34.88		(69)
Pumps and fans	s gains	(Table 5	ā)											
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. eva	aporatio	n (negat	ive valu	es) (Tab	le 5)								_	
(71)m= -95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95.05	-95	.05	-95.05	-95.05	-95.05	-95.05]	(71)
Water heating g	gains (T	able 5)											_	
(72)m= 116.18	114.08	109.74	103.83	99.99	94.58	89.99	95.	88	97.97	104.09	110.99	114.09]	(72)
Total internal g	gains =				(6	6)m + (67)n	า + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m	_	
(73)m= 406.79	404.78	391.83	370.92	349.73	329.24	315.9	321	1.7	332.4	353.51	377.78	395.95		(73)
6. Solar gains:														
Solar gains are ca		ŭ				•	ations	to co	nvert to th	e applica		tion.		
Orientation: Ac	ccess F able 6d	actor	Area m²			lux able 6a		т	g_ able 6b	7	FF able 6c		Gains (W)	
							1						. ,	٦
Northeast 0.9x	0.3	X	1.9		X	11.28	X		0.63		0.7	_ =	2.57	<u> </u> (75)
Northeast 0.9x	0.3	X	2.0		X _	11.28	X		0.63	×	0.7	=	2.78	(75)
Northeast 0.9x	0.3	×	1.9		x	22.97	X		0.63	x	0.7	=	5.22	<u> </u> (75)
Northeast _{0.9x}	0.3	X	2.0)7	x	22.97	X	<u></u>	0.63	x	0.7	=	5.66	(75)
Northeast _{0.9x}	0.3	X	1.9)1	х	41.38	X		0.63	X	0.7	=	9.41	(75)

				ı								_
Northeast 0.9x	0.3	X	2.07	X	41.38	X	0.63	X	0.7	=	10.2	(75)
Northeast _{0.9x}	0.3	X	1.91	X	67.96	X	0.63	X	0.7	=	15.45	(75)
Northeast 0.9x	0.3	х	2.07	X	67.96	X	0.63	X	0.7	=	16.75	(75)
Northeast _{0.9x}	0.3	X	1.91	X	91.35	X	0.63	X	0.7	=	20.77	(75)
Northeast _{0.9x}	0.3	X	2.07	X	91.35	X	0.63	X	0.7	=	22.51	(75)
Northeast _{0.9x}	0.3	x	1.91	X	97.38	X	0.63	X	0.7	=	22.15	(75)
Northeast _{0.9x}	0.3	X	2.07	x	97.38	x	0.63	X	0.7	=	24	(75)
Northeast _{0.9x}	0.3	X	1.91	X	91.1	x	0.63	X	0.7	=	20.72	(75)
Northeast _{0.9x}	0.3	X	2.07	X	91.1	x	0.63	X	0.7	=	22.45	(75)
Northeast 0.9x	0.3	X	1.91	x	72.63	x	0.63	X	0.7	=	16.52	(75)
Northeast _{0.9x}	0.3	x	2.07	x	72.63	x	0.63	X	0.7	=	17.9	(75)
Northeast _{0.9x}	0.3	x	1.91	x	50.42	x	0.63	X	0.7	=	11.47	(75)
Northeast _{0.9x}	0.3	x	2.07	х	50.42	x	0.63	X	0.7	=	12.43	(75)
Northeast _{0.9x}	0.3	х	1.91	х	28.07	x	0.63	X	0.7	=	6.38	(75)
Northeast _{0.9x}	0.3	x	2.07	x	28.07	x	0.63	X	0.7	=	6.92	(75)
Northeast _{0.9x}	0.3	х	1.91	х	14.2	x	0.63	X	0.7	=	3.23	(75)
Northeast _{0.9x}	0.3	x	2.07	х	14.2	x	0.63	X	0.7	=	3.5	(75)
Northeast _{0.9x}	0.3	X	1.91	X	9.21	Х	0.63	X	0.7	=	2.1	(75)
Northeast _{0.9x}	0.3	x	2.07	x	9.21	x	0.63	x	0.7	=	2.27	(75)
East 0.9x	0.77	x	2.07	х	19.64	×	0.63	x	0.7	=	24.85	(76)
East 0.9x	0.77	x	2.07	x	19.64	x	0.63	x	0.7	=	24.85	(76)
East 0.9x	0.77	x	2.07	х	19.64	Х	0.63	x	0.7	=	24.85	(76)
East 0.9x	0.77	x	2.07	x	38.42	X	0.63	x	0.7	=	48.61	(76)
East 0.9x	0.77	x	2.07	х	38.42	x	0.63	x	0.7	=	48.61	(76)
East 0.9x	0.77	x	2.07	x	38.42	x	0.63	X	0.7	=	48.61	(76)
East 0.9x	0.77	X	2.07	X	63.27	X	0.63	X	0.7	=	80.06	(76)
East 0.9x	0.77	X	2.07	x	63.27	x	0.63	X	0.7	=	80.06	(76)
East 0.9x	0.77	x	2.07	x	63.27	x	0.63	X	0.7	=	80.06	(76)
East 0.9x	0.77	X	2.07	X	92.28	x	0.63	X	0.7	=	116.76	(76)
East 0.9x	0.77	X	2.07	X	92.28	x	0.63	X	0.7	=	116.76	(76)
East 0.9x	0.77	X	2.07	X	92.28	x	0.63	X	0.7	=	116.76	(76)
East 0.9x	0.77	x	2.07	x	113.09	x	0.63	X	0.7	=	143.09	(76)
East 0.9x	0.77	X	2.07	x	113.09	x	0.63	X	0.7	=	143.09	(76)
East 0.9x	0.77	x	2.07	x	113.09	x	0.63	X	0.7	=	143.09	(76)
East 0.9x	0.77	x	2.07	x	115.77	x	0.63	X	0.7	=	146.48	(76)
East 0.9x	0.77	x	2.07	x	115.77	x	0.63	x	0.7	=	146.48	(76)
East 0.9x	0.77	x	2.07	x	115.77	x	0.63	x	0.7	=	146.48	(76)
East 0.9x	0.77	x	2.07	x	110.22	x	0.63	x	0.7	=	139.45	(76)
East 0.9x	0.77	x	2.07	x	110.22	x	0.63	x	0.7	=	139.45	(76)
East 0.9x	0.77	x	2.07	x	110.22	x	0.63	X	0.7	j =	139.45	(76)
East 0.9x	0.77	х	2.07	x	94.68	x	0.63	X	0.7	=	119.79	(76)

East	0.9x).77	X	2.0)7	X	9	4.68	x	0.63		X	0.7	=	119.	79 (76	3)
East	0.9x).77	X	2.0)7	x	9	4.68	x	0.63		x	0.7	=	119.	79 (76	3)
East	0.9x).77	X	2.0)7	x	7	3.59	X	0.63		x	0.7	=	93.1	1 (76	3)
East	0.9x).77	X	2.0)7	x	7	3.59	x	0.63		x	0.7	=	93.1	1 (76	3)
East	0.9x).77	X	2.0)7	x	7	3.59	X	0.63		x	0.7	=	93.1	1 (76	3)
East	0.9x).77	x	2.0)7	x	4	5.59	x	0.63		x	0.7		57.6	(76	3)
East	0.9x).77	X	2.0)7	x	4	5.59	x	0.63		x	0.7	_ =	57.6	68 (76	3)
East	0.9x).77	x	2.0)7	x	4	5.59	х	0.63		x	0.7	_ =	57.6	68 (76	3)
East	0.9x).77	x	2.0)7	x	2	4.49	х	0.63		x	0.7	-	30.9	08 (76	3)
East	0.9x).77	х	2.0)7	x	2	4.49	x	0.63		x	0.7		30.9	08 (76	3)
East	0.9x).77	X	2.0)7	x	2	4.49	x	0.63		x	0.7	╡ -	30.9	8 (76	3)
East	0.9x).77	x	2.0)7	x	1	6.15	x	0.63		x	0.7	_ =	20.4	4 (76	3)
East	0.9x).77	X	2.0)7	x	1	6.15	X	0.63		x	0.7	╡ -	20.4	4 (76	3)
East	0.9x).77	X	2.0)7	x	1	6.15	X	0.63		x	0.7	╡ -	20.4	4 (76	3)
			_									L					
Solar gair	ns in watt	s. calcul	ated	for eacl	h month	h			(83)m	= Sum(74)m(8	32)m					
1 —	79.9 156		-	382.47	472.56	$\overline{}$	85.58	461.53	393.	78 303.	22 18	86.34	99.68	65.67	7	(83	3)
Total gair	ns – interr	al and	solar	(84)m =	- (73)m	+ (8	33)m	, watts			'						
(84)m = 48	86.69 56°	.5 65	1.6	753.4	822.28	8	14.83	777.43	715.	48 635.	61 53	39.85	477.46	461.63		(84	1)
7 Mean	internal t	emperat	ture (heating	seasoi	n)			À								
	ature duri			<u> </u>		rá e	area f	from Tak	ble 9	Th1 (°C)		_		21	(85	5)
	n factor f					_			,,	,,,,	,						,
Cilloano	in idotoi i							ble 9a)									
	Jan F		П						I Au	ua Se	g	Oct	Nov	Dec	7		
(86)m=	Jan F	eb N	101 II 1ar 98	Apr 0.92	May 0.78		Jun 0.58	Jul 0.42	At 0.4			Oct 0.96	Nov 0.99	Dec 1	7	(86	5)
(86)m=	1 0.9	9 0.	1ar 98	Apr 0.92	May 0.78		Jun).58	Jul 0.42	0.4	8 0.75					3	(86	5)
(86)m=	1 0.9	9 0.	lar 98 e in li	Apr 0.92 ving are	May 0.78 ea T1 (f	follo	Jun 0.58 w ste	Jul 0.42 ps 3 to 7	0.4 7 in T	8 0.79 able 9c)	5 (0.96	0.99	1]	· ·	
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Mean int (87)m= 1	1 0.9 ternal tem 9.97 20.	peratur 12 20 ng heati	98 e in li	Apr 0.92 ving are 20.71	0.78 ea T1 (f	follo 2	Jun 0.58 w ste	Jul 0.42 ps 3 to 7 21	0.4 7 in T	able 9c) 20.9	5 (05 2 C)	0.96	0.99	1		· ·	7)
Mean int (87)m= 1 Tempera (88)m= 2	1 0.9 ternal term 9.97 20. ature during 20.06 20. on factor for	peratur 12 20 ng heati 06 20 or gains	e in li	Apr 0.92 ving are 20.71 eriods ir 20.08	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling,	follo 2 f dw	Jun 0.58 w ste 0.99 relling	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table	0.47 in T 21 able 9 20.0	able 9c) 20.9	5 (05 2 C)	20.65	20.25	19.94		(88	7) 3)
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Mean int (87)m= 1 Tempera (88)m= 2 Utilisatio (89)m=	ternal tem 9.97 20. ature duri 20.06 20. on factor for ternal tem 8.68 18. ternal tem 9.17 19. djustment 9.17 19. c heating of the mean sation factor	perature 19 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.	e in the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second	Apr 0.92 ving are 20.71 eriods ir 20.08 est of do 0.9 he rest 19.75 the wh 20.11 internal 20.11 experience of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of t	May 0.78 ea T1 (f 20.91 n rest of 20.08 welling, 0.72 of dwel 20 ole dwe 20.35 tempe 20.35	follo 2 f dw 2 f dw 2 gratue 2 gratue 2	Jun 0.58 w ste 0.99 relling 0.09 m (se 0.5 T2 (fc 0.08 g) = fl 0.42 are fro 0.42	Jul 0.42 ps 3 to 7 21 from Ta 20.09 ee Table 0.34 collow ste 20.09 LA × T1 20.43 m Table 20.43 ep 11 of	0.4 7 in T 21 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 20.4 Table	8 0.78 8 0.78 8 0.78 9 20.0 9 0.66 10 7 in T 10 20.0 - fLA) × 43 20.3 where ap 43 20.3	5 (20) 09 2 8 (20) 8 (20) 6 1 6 1 6 1 7 2 9 2 9 2 9 2 9 2 9 1 9 2 9 1 9 2 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1	20.65 20.08 20.094 20.094 9.68 = Liv	0.99 20.25 20.08 0.99 19.11 ing area ÷ (4 19.54 19.54	1 19.94 20.07 1 18.66 4) = 19.14 19.14 d re-ca	0.34	(87 (88 (89 (90 8 (91	77) 33) 99) 11)
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9) 9) 11) 22) 33)

Useful gains, hmGm , W = (94)m x (84)m	1	ı	ı	ı	(0.5)
(95)m= 484.28 555.29 630.85 675.25 608.5 430.81 286.8 300.43 447.14	507.99	472.33	459.88		(95)
Monthly average external temperature from Table 8	100	7.4	1 40	1	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W = $[(39)m \times [(93)m - (96)n]]$ (97)m= 1156.72 1122.14 1020.98 854.13 656.96 436.8 287.44 301.72 473.89		950.55	1148.36		(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (97)m]$		<u> </u>	1140.30		(01)
Space fleating requirement for each month, kwin/month = $0.024 \times [(97)\text{m} - (98)\text{m}] = 500.3 380.92 290.26 128.79 36.06 0 0 0 0$	156.27	344.32	512.22		
Total per year			l	2349.14	(98)
	ii (KVVII) yeai) = Odin(3	0)15,912 —		╡```
Space heating requirement in kWh/m²/year				31.03	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)					
Space heating:			1		٦
Fraction of space heat from secondary/supplementary system				0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$	=			1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (204)] = (202) \times [1 - (204)] = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (20$	- (203)] =			1	(204)
Efficiency of main space heating system 1				93.5	(206)
Efficiency of secondary/supplementary heating system, %				0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct	Nov	Dec	kWh/ye	– ar
Space heating requirement (calculated above)					
500.3 380.92 290.26 128.79 36.06 0 0 0	156.27	344.32	512.22		
$(211)m = \{[(98)m \times (204)]\} \times 100 \div (206)$					(211)
535.08 407.41 310.44 137.74 38.57 0 0 0 0	167.13	368.26	547.83		, ,
Total (kWh/y	ear) =Sum(2	211),15,101	<u></u>	2512.45	(211)
Space heating fuel (secondary), kWh/month			!		_
$= \{[(98)m \times (201)]\} \times 100 \div (208)$					
(215)m= 0 0 0 0 0 0 0 0 0	0	0	0		
Total (kWh/y	ear) =Sum(2	215) _{15,101}		0	(215)
Water heating			'		
Output from water heater (calculated above)	_	ī		I	
194.45 171.4 180.03 161.43 158.22 141.42 135.85 149.02 148.74	167.39	176.95	189.78		_
Efficiency of water heater	_		,	79.8	(216)
(217)m= 87.23 86.88 86.08 84.22 81.59 79.8 79.8 79.8 79.8	84.63	86.56	87.33		(217)
Fuel for water heating, kWh/month					
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 222.92 197.27 209.14 191.67 193.92 177.21 170.24 186.74 186.39 $	197.78	204.42	217.3		
Total = Sum(201.12	1 217.0	2355.02	(219)
Annual totals		Wh/yeaı	•	kWh/yea	
Space heating fuel used, main system 1	N.	vvii/y c ai		2512.45	7
Water heating fuel used					┪
•				2355.02	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)

boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				331.17	(232)
12a. CO2 emissions – Individual heating syst	tems including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	542.69	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	508.68	(264)
Space and water heating	(261) + (262) + (263) + (264) =				(265)

0.519

0.519

sum of (265)...(271) =

(231) x

(232) x

TER = 24.31 (273)

Electricity for pumps, fans and electric keep-hot

Electricity for lighting

Total CO2, kg/year

(267)

(268)

(272)

38.93

171.88

1262.18

		User [Details:						
Assessor Name: Software Name:	Stroma FSAP 2012	a Num	rsion:		Versio	on: 1.0.4.26			
Address :		Property	Address	: C85_B	e Green				
1. Overall dwelling dime	ensions:								
		Are	a(m²)	1	Av. He	ight(m)	,	Volume(m ³	<u> </u>
Ground floor			73.4	(1a) x	2	2.8	(2a) =	205.52	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	73.4	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	205.52	(5)
2. Ventilation rate:									
	main second heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	=	0	X	40 =	0	(6a)
Number of open flues	0 + 0	= +	0	<u> </u>	0	x	20 =	0	(6b)
Number of intermittent fa	ns				0	x	10 =	0	(7a)
Number of passive vents				F	0	X	10 =	0	(7b)
Number of flueless gas fi				L	0	X	40 =	0	(7c)
				L				nanges per ho	
	ys, flues and fans = (6a)+(6b)- een carried out or is intended, proc			continuo f	0		\div (5) =	0	(8)
Number of storeys in the		eed 10 (17),	ourerwise (continue ir	OIII (9) 10 ((10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame	or 0.35 fo	r mason	ry consti	ruction			0	(11)
if both types of wall are pu deducting areas of openin	resent, use the value corresponding	to the grea	ter wall are	ea (after					
• ,	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic met	•	•	•	etre of e	envelope	area	3	(17)
·	ity value, then $(18) = [(17) \div 20]$ as if a pressurisation test has been of				is heina u	sed		0.15	(18)
Number of sides sheltere		one or a de	gree an pe	Titleability	is being u	3CU		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	s) x (20) =				0.13	(21)
Infiltration rate modified f	or monthly wind speed	_							•
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	eed from Table 7							-	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	1	
` ′	1 1 3 1 8.88			<u> </u>			<u> </u>	J	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effec		-	rate for t	he appli	cable ca	se	!					, 	
If mechanica			l' N (0	01.) (00	\ - /	/	15// (1	. (00)	\ (00.)			0.5	(23a
If exhaust air he) = (23a)			0.5	(23b
If balanced with		•	•	_								76.5	(230
a) If balance						- ` ` 	- ` ` - 	ŕ	r ´ `		``	i ÷ 100] I	(0.4-
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	J	(24a
b) If balance							r ``	i `	r Ó - Ò	 		1	(O.4h
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole he if (22b)m				•					5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural v if (22b)m				•	•				0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m = 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losses	and he	eat loss	paramete	er:							_	_	_
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Doors Type 1					2.5	x	1.3	=	3.25				(26)
Doo <mark>rs Ty</mark> pe 2					2.5	X	1	<u></u>	2.5	Ħ			(26)
Windows Type	1				1.9	x1.	/[1/(1.3)+	0.04] =	2.35	Ħ			(27)
Windows Type	2				4.1	x1.	/[1/(1.3)+	0.04] =	5.07	5			(27)
Windows Type	3				2.6	x1.	/[1/(1.3)+	0.04] =	3.21	=			(27)
Windows Type	4				5.1	x1.	/[1/(1.3)+	0.04] =	6.3	=			(27)
Windows Type	5				2.6	x ₁ ,	/[1/(1.3)+	0.04] =	3.21	Ħ			(27)
Walls	83.1	6	26.5		56.66	x	0.15	i	8.5	=			(29)
Total area of el					83.16	=							(31)
* for windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	(-)
** include the area	s on both	sides of in	nternal wali	ls and part	titions								
Fabric heat los		•	U)				(26)(30)) + (32) =				40.82	(33)
Heat capacity (`	,						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	-								tive Value			250	(35)
For design assess can be used instead				constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	,	,			•	<						4.16	(36)
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			44.98	(37)
Ventilation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 18.99	18.78	18.56	17.48	17.26	16.18	16.18	15.97	16.62	17.26	17.7	18.13	1	(38)
Heat transfer c	oefficier	nt, W/K			•	•	•	(39)m	= (37) + (37)	38)m	•	•	
(39)m= 63.97	63.76	63.54	62.46	62.24	61.16	61.16	60.95	61.59	62.24	62.67	63.11]	
Stroma FSAP 2012	2 Version:	1.0.4.26 ((SAP 9.92)	- http://wv	ww.stroma	.com		•	Average =	Sum(39) ₁	12 /12=	62.4	Page 2 (39)

Heat loss para	ımeter (l	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.87	0.87	0.85	0.85	0.83	0.83	0.83	0.84	0.85	0.85	0.86		
	ı			ı					Average =	Sum(40) ₁	12 /12=	0.85	(40)
Number of day		nth (Tab	le 1a)		1	1	1	ı					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		33		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		.44		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 98.38	94.8	91.23	87.65	84.07	80.49	80.49	84.07	87.65	91.23	94.8	98.38		
		•				•				m(44) ₁₁₂ =		1073.24	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,ı	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 145.9	127.6	131.67	114.8	110.15	95.05	88.08	101.07	102.28	119.2	130.11	141.29		_
If instantaneous w	ater heati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =	<u> </u>	1407.19	(45)
						_			47.00	40.50	24.40		(46)
(46)m= 21.88 Water storage	19.14 loss:	19.75	17.22	16.52	14.26	13.21	15.16	15.34	17.88	19.52	21.19		(40)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage					(1.14.11								
a) If manufact				or is kno	wn (kVVI	n/day):				1.	63		(48)
Temperature f										0	.6		(49)
Energy lost fro b) If manufact		_	-		or ic not		(48) x (49)) =		0.	98		(50)
Hot water stor			-								0		(51)
If community h	-			•		,					<u> </u>		, ,
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (. , .	,								0.	98		(55)
Water storage	loss cal	culated	for each	month	_		((56)m = ((55) × (41)	m				
(56)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3		·	·				0		(58)
Primary circuit	•	•			59)m =	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wa	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0 0	0	0	0 1)111 =	00) + \	000 x (41)III 0	Т	0	0	0	0]	(61)
									-				J (59)m + (61)m	(0.)
(62)m= 199.4	-i	185.25	166.65	163.73	146.9	141.66	154.	_	154.13	172.78	181.96	194.87	(39)111 + (01)111	(62)
Solar DHW inp													J	(02)
(add addition										CONTINUE	ition to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0]	(63)
Output from	water hea	ter											I	
(64)m= 199.4		185.25	166.65	163.73	146.9	141.66	154.	65	154.13	172.78	181.96	194.87]	
	Į	<u> </u>				_!	(<u> </u>	ut from wa	ater heat	_ I er (annual)₁	12	2038.06	(64)
Heat gains f	rom water	heating.	kWh/me	onth 0.2	8.01 ` 5	5 × (45)m	1 + (6 ⁻	1)m]	l + 0.8 x	: [(46)m	+ (57)m	+ (59)m	1	_
(65)m= 91.3°		86.65	79.65	79.49	73.09	72.15	76.4		75.49	82.5	84.74	89.84]	(65)
include (5	 7)m in cal	culation o	of (65)m	only if c	ulinder Vlinder	is in the	dwelli	na c	or hot w	ater is t	rom com	munity h	ı neating	
5. Internal					<i>,</i>								.oag	
Metabolic ga				,										
Jar		Mar	Apr	May	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
(66)m= 116.2	9 116.29	116.29	116.29	116.29	116.29	116.29	116.	29	116.29	116.29	116.29	116.29		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	ee T	able 5					
(67)m= 18.28	3 16.24	13.21	10	7.47	6.31	6.82	8.8	6	11.9	15.1	17.63	18.79		(67)
Appliances of	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation	L13 or L1	3 a), a	also	see Tal	ole 5				
(68)m= 205.	,	201.86	190.45	176.03	162.49		151.	_	156.67	168.09	182.5	196.05		(68)
Cooking gai	ns (calcula	ited in A	pendix	L, equat	ion L1	or L15a), also	o se	e Table	5				
(69)m= 34.63	<u> </u>	34.63	34.63	34.63	34.63	34.63	34.6	_	34.63	34.63	34.63	34.63		(69)
Pumps and	fans gains	(Table 5	āa)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	ive valu	es) (Tab	le 5)	_!		- '			Į.		1	
(71)m= -93.0	3 -93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.0	03	-93.03	-93.03	-93.03	-93.03		(71)
Water heatir	ng gains (1	able 5)											•	
(72)m= 122.8	2 120.75	116.46	110.63	106.84	101.51	96.98	102.	78	104.85	110.88	117.7	120.76]	(72)
Total intern	al gains =				(6	6)m + (67)m	n + (68)m +	(69)m + (70)m + (71)m + (72))m	1	
(73)m= 404.0	9 402.1	389.42	368.96	348.23	328.19	315.12	320.	84	331.3	351.96	375.72	393.49		(73)
6. Solar ga	ins:													
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations t	o cor	overt to th	e applica	ble orienta	tion.		
Orientation:			Area			ux			g	_	FF		Gains	
	Table 6d		m²		Ta	able 6a		la	able 6b		Table 6c		(W)	_
East 0.9	× 0.77	Х	2.	6	х	19.64	x		0.53	x	0.8	=	30.01	(76)
East 0.9	× 0.77	Х	2.	6	x	19.64	x		0.53	x [0.8	=	30.01	(76)
East 0.9	× 0.77	X	2.	6	x	38.42	x_[0.53	x [0.8	=	58.7	(76)
East 0.9	× 0.77	X	2.	6	х	38.42	_ x [0.53	x [0.8	=	58.7	(76)
East 0.9	x 0.77	X	2.	6	X	63.27	x		0.53	X	0.8	=	96.68	(76)

	_						ı						_
East	0.9x	0.77	X	2.6	X	63.27	X	0.53	X	0.8	=	96.68	(76)
East	0.9x	0.77	X	2.6	x	92.28	X	0.53	X	0.8	=	141	(76)
East	0.9x	0.77	X	2.6	X	92.28	X	0.53	X	0.8	=	141	(76)
East	0.9x	0.77	X	2.6	x	113.09	x	0.53	X	0.8	=	172.8	(76)
East	0.9x	0.77	X	2.6	X	113.09	X	0.53	X	0.8	=	172.8	(76)
East	0.9x	0.77	X	2.6	X	115.77	x	0.53	X	0.8	=	176.89	(76)
East	0.9x	0.77	X	2.6	x	115.77	x	0.53	X	0.8	=	176.89	(76)
East	0.9x	0.77	X	2.6	x	110.22	x	0.53	X	0.8	=	168.41	(76)
East	0.9x	0.77	X	2.6	X	110.22	x	0.53	X	0.8	=	168.41	(76)
East	0.9x	0.77	X	2.6	x	94.68	x	0.53	X	0.8	=	144.66	(76)
East	0.9x	0.77	X	2.6	x	94.68	x	0.53	X	0.8	=	144.66	(76)
East	0.9x	0.77	X	2.6	x	73.59	x	0.53	X	0.8	=	112.44	(76)
East	0.9x	0.77	x	2.6	x	73.59	x	0.53	x	0.8	=	112.44	(76)
East	0.9x	0.77	x	2.6	x	45.59	x	0.53	x	0.8	=	69.66	(76)
East	0.9x	0.77	X	2.6	x	45.59	x	0.53	X	0.8	=	69.66	(76)
East	0.9x	0.77	x	2.6	x	24.49	x	0.53	X	0.8	=	37.42	(76)
East	0.9x	0.77	x	2.6	x	24.49	x	0.53	x	0.8	=	37.42	(76)
East	0.9x	0.77	X	2.6	X	16.15	Х	0.53	X	0.8	=	24.68	(76)
East	0.9x	0.77	x	2.6	x	16.15	×	0.53	x	0.8	=	24.68	(76)
South	0.9x	0.77	x	1.9	х	46.75	×	0.53	x	0.7	=	22.84	(78)
South	0.9x	0.77	x	1.9	x	76.57	x	0.53	x	0.7	=	37.4	(78)
South	0.9x	0.77	x	1.9	х	97.53	Х	0.53	x	0.7	=	47.64	(78)
South	0.9x	0.77	x	1.9	x	110.23	X	0.53	x	0.7	=	53.85	(78)
South	0.9x	0.77	x	1.9	х	114.87	x	0.53	x	0.7	=	56.11	(78)
South	0.9x	0.77	X	1.9	x	110.55	x	0.53	X	0.7	=	54	(78)
South	0.9x	0.77	X	1.9	x	108.01	x	0.53	X	0.7	=	52.76	(78)
South	0.9x	0.77	X	1.9	x	104.89	x	0.53	X	0.7	=	51.24	(78)
South	0.9x	0.77	x	1.9	x	101.89	x	0.53	X	0.7	=	49.77	(78)
South	0.9x	0.77	x	1.9	x	82.59	x	0.53	x	0.7	=	40.34	(78)
South	0.9x	0.77	x	1.9	x	55.42	x	0.53	x	0.7	=	27.07	(78)
South	0.9x	0.77	x	1.9	x	40.4	x	0.53	X	0.7	=	19.73	(78)
West	0.9x	0.77	x	4.1	x	19.64	x	0.53	X	0.8	=	23.66	(80)
West	0.9x	0.77	x	5.1	x	19.64	x	0.53	X	0.8	=	29.43	(80)
West	0.9x	0.77	X	4.1	x	38.42	x	0.53	X	0.8	=	46.29	(80)
West	0.9x	0.77	X	5.1	x	38.42	x	0.53	X	0.8	=	57.57	(80)
West	0.9x	0.77	x	4.1	x	63.27	x	0.53	x	0.8	=	76.23	(80)
West	0.9x	0.77	x	5.1	x	63.27	x	0.53	x	0.8	j =	94.82	(80)
West	0.9x	0.77	x	4.1	x	92.28	x	0.53	x	0.8	j =	111.17	(80)
West	0.9x	0.77	x	5.1	x	92.28	x	0.53	x	0.8	j =	138.29	(80)
West	0.9x	0.77	x	4.1	x	113.09	x	0.53	x	0.8	j =	136.24	(80)
West	0.9x	0.77	x	5.1	x	113.09	x	0.53	x	0.8	j =	169.47	(80)
	_		•		•		1				•		-

West	0.9x	0.77	X	4.	1	x	11	15.77	X		0.53	X	0.8		=	139.47	(80)
West	0.9x	0.77	x	5.	1	X	1	15.77	x		0.53	x	0.8		=	173.49	(80)
West	0.9x	0.77	X	4.	1	X	11	10.22	x		0.53	x	0.8		=	132.78	(80)
West	0.9x	0.77	X	5.	1	X	11	10.22	X		0.53	x	0.8		=	165.17	(80)
West	0.9x	0.77	x	4.	1	X	9	4.68	x		0.53	x	0.8		=	114.06	(80)
West	0.9x	0.77	x	5.	1	X	9	4.68	x		0.53	x	0.8		=	141.88	(80)
West	0.9x	0.77	x	4.	1	X	7	3.59	x		0.53	×	0.8		=	88.65	(80)
West	0.9x	0.77	x	5.	1	X	7	3.59	x		0.53	x	0.8		=	110.28	(80)
West	0.9x	0.77	x	4.	1	X	4	5.59	x		0.53	x	0.8		=	54.92	(80)
West	0.9x	0.77	X	5.	1	X	4	5.59	x		0.53	×	0.8		=	68.32	(80)
West	0.9x	0.77	X	4.	1	X	2	4.49	x		0.53	×	0.8		=	29.5	(80)
West	0.9x	0.77	X	5.	1	X	2	4.49	x		0.53	×	0.8		=	36.7	(80)
West	0.9x	0.77	X	4.′	1	X	1	6.15	x		0.53	×	0.8		=	19.46	(80)
West	0.9x	0.77	X	5.	1	X	1	6.15	x		0.53	x	0.8		=	24.2	(80)
	_																
Solar ga	ins in	watts, cald	culated	for each	h month	1			(83)m	ı = Suı	m(74)m .	(82)m					
(83)m=	135.95	258.67	412.04	585.3	707.43	72	20.74	687.52	596	.49	473.58	302.9	168.11	112.	75		(83)
Total ga	ins – ir	nternal an	d solar	(84)m =	- (73)m	+ (8	83)m	, watts									
(84)m=	540.03	660.77	801.46	954.26	1055.66	10	48.93	1002.64	917.	.33	804.88	654.86	543.82	506.	24		(84)
7. Mea	n inter	nal tempe	rature (heating	seasor												
		during he				<u> </u>	area f	rom Tak	ole 9,	Th1	(°C)					21	(85)
		J	<u> </u>														
Utilisati	on fac	tor for gain	ns for li	ving are	ea. h1.n	n (s	ee Ta	ble 9a)									_
Utilisati		tor for gai							A	ug	Sep	Oct	Nov	De	ec		
Utilisati	Jan 0.99	Feb 0.98	ns for li Mar 0.92	ving are Apr 0.75	ea, h1,n May 0.54		ee Ta Jun 0.37	ble 9a) Jul 0.27	Aı 0.3	ug 11	Sep 0.52	Oct	Nov 0.98	De			(86)
(86)m=	Jan 0.99	Feb 0.98	Mar 0.92	Apr 0.75	May 0.54		Jun 0.37	Jul 0.27	0.3	31	0.52	_	_	 			(86)
(86)m=	Jan 0.99 nterna	Feb 0.98 temperat	Mar 0.92	Apr 0.75	May 0.54		Jun 0.37	Jul 0.27	0.3	able	0.52	_	0.98	 			(86)
(86)m= Mean ir	Jan 0.99 nternal 20.28	Feb 0.98 I temperat 20.49	0.92 cure in 10 20.75	Apr 0.75 iving are 20.94	May 0.54 ea T1 (f 20.99	follo	Jun 0.37 ow ste 21	Jul 0.27 ps 3 to 7 21	0.3 7 in T 2	able	9c) 21	0.86	0.98	1			` ′
(86)m= Mean ir (87)m= Tempe	Jan 0.99 nterna 20.28 rature	Feb 0.98 I temperat 20.49 during hea	Mar 0.92 cure in l 20.75	Apr 0.75 iving are 20.94 eriods ir	0.54 ea T1 (f 20.99	f dw	Jun 0.37 ow ste 21 velling	Jul 0.27 ps 3 to 7 21 from Ta	0.37 in T	able of This	0.52 9c) 21 2 (°C)	20.89	0.98	20.2	25		(87)
(86)m=	Jan 0.99 Internal 20.28 rature 20.19	Feb 0.98 I temperat 20.49 during head 20.19	Mar 0.92 cure in li 20.75 ating pe	Apr 0.75 iving are 20.94 eriods in 20.21	May 0.54 ea T1 (f 20.99 or rest of 20.21	f dw	Jun 0.37 ow ste 21 velling 20.22	Jul 0.27 ps 3 to 7 21 from Ta 20.22	0.37 in T	able of This	9c) 21	0.86	0.98	1	25		` ′
(86)m= Mean ir (87)m= Temper (88)m= Utilisati	Jan 0.99 nternal 20.28 rature 20.19	Feb 0.98 I temperat 20.49 during head 20.19 tor for gain	Mar 0.92 cure in li 20.75 ating per 20.2 ns for re	Apr 0.75 iving are 20.94 eriods ir 20.21 est of de	May 0.54 ea T1 (f 20.99 rest of 20.21 welling,	f dw	Jun 0.37 ow ste 21 velling 20.22 ,m (se	Jul 0.27 ps 3 to 7 21 from Ta 20.22 pe Table	0.37 in T	able 1 9, Th	9c) 21 2 (°C) 20.22	20.89	20.54	20.2	25		(87)
(86)m= Mean ir (87)m= Temper (88)m= Utilisati	Jan 0.99 Internal 20.28 rature 20.19	Feb 0.98 I temperat 20.49 during head 20.19	Mar 0.92 cure in li 20.75 ating pe	Apr 0.75 iving are 20.94 eriods in 20.21	May 0.54 ea T1 (f 20.99 or rest of 20.21	f dw	Jun 0.37 ow ste 21 velling 20.22	Jul 0.27 ps 3 to 7 21 from Ta 20.22	0.37 in T	able 1 9, Th	0.52 9c) 21 2 (°C)	20.89	0.98	20.2	25		(87)
(86)m=	Jan 0.99 Internal 20.28 rature 20.19 ion fac 0.99	Feb 0.98 I temperat 20.49 during head 20.19 tor for gain	Mar 0.92 cure in li 20.75 ating per 20.2 ns for re 0.9	Apr 0.75 iving are 20.94 eriods in 20.21 est of do	May 0.54 ea T1 (f 20.99 or rest of 20.21 welling, 0.5	f dw 2 h2,	Jun 0.37 ow ste 21 velling 20.22 ,m (se 0.33	Jul 0.27 ps 3 to 7 21 from Ta 20.22 pe Table 0.22	0.37 in T 24 able 9 20.39 9a) 0.20	fable 1 9, Th:	0.52 9c) 21 2 (°C) 20.22	0.86 20.89 20.21	20.54	20.2	25		(87)
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20.9	Table 1 1 1 2 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1	0.52 9c) 21 2 (°C) 20.22 0.47 in Table 20.22 f A) × T2 20.5 re approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate approximate 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Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 534.33 639.61 719.01 687.83 543.62 361.21 239.11 250.53 392.47 545.26 528.91 502.42		(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		
(97)m= 980.35 955.39 871.13 720.89 547.44 361.43 239.13 250.57 394.4 609.13 806.37 970.91		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m		
(98)m= 331.83 212.21 113.17 23.81 2.84 0 0 0 0 47.52 199.77 348.56	4070.74	7(00)
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = Space heating requirement in kWh/m²/year	1279.71	(98) (99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system $1 - (301) =$	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	ne latter	
Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.25	(306)
Space heating	kWh/year	_
Annual space heating requirement	1279.71	
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1599.63	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating		_
Annual water heating requirement	2038.06	
If DHW from community scheme: Water heat from Community heat pump (64) x (303a) x (305) x (306) =	2547.57	(310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = \begin{bmatrix} 0.01 \times [(307a)(307e) + (310a)(310e)] \end{bmatrix}$	41.47	(313)
Cooling System Energy Efficiency Ratio	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	191.18	(330a)
warm air heating system fans	0	(330b)
pump for solar water heating	0	(330g)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) =	191.18	(331)
Energy for lighting (calculated in Appendix L)	322.91	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-477.54] (333)
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Electricity generated by wind turbine (Appendix M) (negative quantity) (334)12b. CO2 Emissions – Community heating scheme Energy **Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) 319 (367a) CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$ 674.73 (367)0.52 Electrical energy for heat distribution (372)[(313) x]0.52 21.52 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)696.26 CO2 associated with space heating (secondary) (309) x(374)0 CO2 associated with water from immersion heater or instantaneous heater (312) x (375)0.52 0 Total CO2 associated with space and water heating (373) + (374) + (375) =696.26 (376)CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 99.23 CO2 associated with electricity for lighting (332))) x (379)0.52 167.59 Energy saving/generation technologies (333) to (334) as applicable Item 1 x = 0.01 =(380) 0.52 -247.84 sum of (376)...(382) = Total CO2, kg/year (383)715.23 $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)9.74 El rating (section 14) (385)91.91

			User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 20	112		Strom Softwa				Versic	on: 1.0.4.26	
		Р	roperty	Address	: C85_E	e Green	1			
Address :										
Overall dwelling dimer	nsions:		A	- (2)		A 11-	¹ l. 4 (\		Malara a faci	٠,
Ground floor			_	a(m²) 73.4	(1a) x		2.8	(2a) =	Volume(m ² 205.52	?) (3a
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1)	73.4	(4)					
Dwelling volume					(3a)+(3b	o)+(3c)+(3c	d)+(3e)+	.(3n) =	205.52	(5)
2. Ventilation rate:										
Number of chimneys	main heating 0 +	secondar heating	у П + Г	other 0	7 ₌ [total 0	x	40 =	m³ per hou	ır ☐(6a
Number of open flues	0 +	0	」	0	」		x	20 =	0	(6b
·		0	J	0	J	0		10 =		╡`
Number of intermittent far	IS				Ļ	3			30	(7a
Number of passive vents					Ĺ	0		10 =	0	(7b
Number of flueless gas fir	es					0	X ·	40 =	0	(7c
								Δir ch	nanges per he	our
Infiltration due to chimney	rs fluor and fans –	(6a)+(6b)+(7	′a)±(7h)±(70) -	Г		_			
If a pressurisation test has be					continue f	30 rom (9) to		÷ (5) =	0.15	(8)
Number of storeys in th							-/		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10
Structural infiltration: 0.2					•	ruction			0	(11
if both types of wall are pre deducting areas of opening		esponding to	the grea	ter wall are	a (after					
If suspended wooden fl		aled) or 0.	.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, enter	er 0.05, else enter 0								0	(13
Percentage of windows	and doors draught	stripped							0	(14
Window infiltration				0.25 - [0.2	. ,	-	4		0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value, or If based on air permeability	•		•	•	•	netre of e	envelope	area	5	(17
Air permeability value applies						is beina u	ised		0.4	(18
Number of sides sheltered		ao soon aon	,o o, a ao,	groo an po	modelinty	io zomig u	oou		2	(19
Shelter factor				(20) = 1 -	[0.075 x (19)] =			0.85	(20
Infiltration rate incorporati	ng shelter factor			(21) = (18) x (20) =				0.34	(21
Infiltration rate modified for	or monthly wind spec	ed								
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Footor (22a) (22										
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25 1	2)m ÷ 4 1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
(224)111- 1.21 1.20 1	1.100	0.90	0.90	0.32	<u> </u>	1.00	1.14	1.10	J	

		<u> </u>			_		(21a) x	<u> </u>	ı	T	1	1	
0.43 alculate effe	0.42	0.41 change	0.37	0.36 he appli	0.32	0.32 Se	0.31	0.34	0.36	0.38	0.4	J	
If mechanica		_	ato for t	по арріі	oabio oa	00						0	(
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	wise (23b) = (23a)			0	(
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =				0	
a) If balance	d mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (2	2b)m + (23b) × [1 – (23c)	÷ 100]	
1a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
b) If balance	d mech	anical ve	entilation	without	heat red	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)	•	•	
lb)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
c) If whole h				•	•				.5 × (23b))	•	•	
c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
d) If natural if (22b)n				•					0.5]	•	•		
d)m= 0.59	0.59	0.58	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)			•	•	
5)m= 0.59	0.59	0.58	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(
. Heat losse	s and he	eat loss r	naramete	or.					_		_		
EMENT	Gros area	ss	Openin m	gs	Net Ar A ,n		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
o <mark>rs Type 1</mark>					2.5	x	1.2	=	3	Ė.			(
ors Type 2					2.5	X	1.2	=\=	3	Ħ			
indows Type	1				1.18	x1	/[1/(1.4)+	0.04] =	1.56	Ħ			(
indows Type	2				2.55	x ₁	/[1/(1.4)+	0.04] =	3.38	4			(
ndows Type					1.61	=	/[1/(1.4)+		2.13	=			(
indows Type					3.17	=	- /[1/(1.4)+		4.2	\dashv			(
indows Type					1.61				2.13	\dashv			(
alls		6	18.3	4		_		— ;		╡ ,			(
otal area of e	83.1		18.3	4	64.82	=	0.18	=	11.67				
or windows and			offective wi	ndow H-vs	83.16		ı formula 1	/[(1/ ₋ valı	ا 0.41 مراها	as aiven in	naragrani	132	(
nclude the area						atou using	i Torritula 1	/[(i/ O - vaic	10)+0.0 -1] 0	is given in	paragrapi	7 3.2	
bric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				35.3	5 (
at capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(
ermal mass	parame	ter (TMF	P = Cm ÷	TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250) (
r design assess n be used inste				constructi	ion are not	known pi	ecisely the	indicative	e values of	TMP in Ta	able 1f		
ermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix k	(4.10	6 (
etails of therma tal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	· (36) =			39.5	51 (
ntilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))	,	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
40.16	39.91	39.68	38.56	38.35	37.38	37.38	37.2	37.75	38.35	38.77	39.21		(
	coefficier	nt. W/K						(39)m	= (37) + (3	38)m			
at transfer o	,001110101	,						` '	, , ,				

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.09	1.08	1.08	1.06	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.07		
(10)									<u> </u>	Sum(40) ₁ .		1.06	(40)
Number of day	s in mo	nth (Tabl	le 1a)					•	tvolago =	Curri (10)	12 / 12—	1.00	()
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
` /						l	l	l		<u> </u>			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13		33		(42)
Annual averag Reduce the annua not more that 125	ıl average	hot water	usage by	5% if the a	lwelling is	designed			se target o		.44		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Διια	Sep	Oct	Nov	Dec		
Hot water usage in			-				Aug (43)	Sep	Oct	INOV	Dec		
	,		87.65			1	· <i>′</i>	87.65	04.00	1 04 8	00.20		
(44)m= 98.38	94.8	91.23	67.05	84.07	80.49	80.49	84.07		91.23	94.8	98.38	1072.24	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1073.24	(44)
(45)m= 145.9	127.6	131.67	114.8	110.15	95.05	88.08	101.07	102.28	119.2	130.11	141.29		
(40)1112 143.3	127.0	131.07	114.0	110.13	33.03	00.00	101.07			m(45) ₁₁₂ =	l .	1407.19	(45)
If inst <mark>antane</mark> ous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar = Su	111(43)112 =		1407.19	(40)
(46)m= 21.88	19.14	19.75	17.22	16.52	14.26	13.21	15.16	15.34	17.88	19.52	21.19		(46)
Water storage		10.10	111.22	10.02	11.20	0.21	10.10	10.01	17.00	10.02	21110		(- /
Storage volum	e (litres)	includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	_			_				ers) ente	er '0' in ((47)			
Water storage	loss:												
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufact			-										
Hot water stora	-			e 2 (kWl	h/litre/da	ay)					0		(51)
If community h	•		on 4.3										(==)
Volume factor Temperature fa			2h								0		(52)
•							()	>	>		0		(53)
Energy lost fro		_	, KVVh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (,					(/==)			0.	75		(55)
Water storage	loss cal	culated t	or each	month			((56)m = (55) × (41)ı	m 				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	•	•									0		(58)
Primary circuit				•	•	. ,	, ,						
(modified by							<u> </u>		ı —	- 			/=c:
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combiles	ام مامان مام	fa., a a a b		(04)	(00) . 20	CE (44)	١						
Combi loss (61)m= 0	calculated 0	or each		0	(60) ÷ 30	05 × (41))m 0	0	0	0	0	1	(61)
				<u> </u>			<u> </u>	Ļ	<u> </u>	ļ.	ļ	(E0)m + (61)m	(01)
(62)m= 192.4	-i	178.27	159.89	156.74	140.14	134.67	147.67	147.37	165.79	175.2	187.89	· (59)m + (61)m]	(62)
Solar DHW inp			<u> </u>	<u> </u>		<u> </u>		1				J	(02)
(add addition									ii contribu	iion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0]	(63)
Output from	water hea	ter					Į					ı	
(64)m= 192.4		178.27	159.89	156.74	140.14	134.67	147.67	147.37	165.79	175.2	187.89]	
						•	Out	put from w	ater heate	r (annual)	12	1955.81	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 85.7	1	81.06	74.24	73.9	67.68	66.56	70.88	70.08	76.91	79.34	84.26	1	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):	-								
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 116.2	9 116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29	116.29		(66)
Ligh <mark>ting g</mark> air	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 18.3	2 16.27	13.23	10.02	7.49	6.32	6.83	8.88	11.92	15.13	17.66	18.83		(67)
App <mark>liance</mark> s (gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m= 205.	1 207.23	201.86	190.45	176.03	162.49	153.44	151.31	156.67	168.09	182.5	196.05		(68)
Cooking gai	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5		-		
(69)m= 34.6	3 34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63	34.63		(69)
Pumps and	fans gains	(Table 5	5a)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m= -93.0	3 -93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03	-93.03		(71)
Water heating	ng gains (1	Table 5)										_	
(72)m= 115.	3 113.24	108.95	103.12	99.33	94	89.46	95.27	97.33	103.37	110.19	113.25		(72)
Total intern	al gains =	:			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 399.6	397.62	384.93	364.46	343.74	323.69	310.62	316.35	326.81	347.48	371.24	389.01		(73)
6. Solar ga	ins:												
Solar gains ar		•				•	itions to c	onvert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a	-	g_ Fable 6b	т	FF able 6c		Gains (W)	
- .							. –		_ '				7
East 0.9		X	1.6			19.64	X	0.63	x	0.7	=	19.33	(76)
East 0.9		X	1.6		_	19.64	x	0.63	x	0.7	=	19.33	(76)
East 0.9			1.6			38.42	x	0.63	x	0.7	=	37.81	<u>(76)</u>
East 0.9		X	1.6		-	38.42	x	0.63	x	0.7	=	37.81	(76)
East 0.9	× 0.77	X	1.6	61	x 6	33.27	X	0.63	X	0.7	=	62.27	(76)

	_												_
East	0.9x	0.77	X	1.61	X	63.27	Х	0.63	X	0.7	=	62.27	(76)
East	0.9x	0.77	X	1.61	x	92.28	X	0.63	X	0.7	=	90.81	(76)
East	0.9x	0.77	X	1.61	X	92.28	X	0.63	X	0.7	=	90.81	(76)
East	0.9x	0.77	X	1.61	x	113.09	x	0.63	X	0.7	=	111.29	(76)
East	0.9x	0.77	X	1.61	x	113.09	X	0.63	X	0.7	=	111.29	(76)
East	0.9x	0.77	X	1.61	X	115.77	X	0.63	X	0.7	=	113.93	(76)
East	0.9x	0.77	X	1.61	x	115.77	X	0.63	X	0.7	=	113.93	(76)
East	0.9x	0.77	X	1.61	x	110.22	x	0.63	X	0.7	=	108.46	(76)
East	0.9x	0.77	X	1.61	X	110.22	x	0.63	X	0.7	=	108.46	(76)
East	0.9x	0.77	X	1.61	x	94.68	x	0.63	X	0.7] =	93.17	(76)
East	0.9x	0.77	X	1.61	x	94.68	x	0.63	X	0.7	=	93.17	(76)
East	0.9x	0.77	X	1.61	x	73.59	x	0.63	X	0.7	=	72.42	(76)
East	0.9x	0.77	x	1.61	x	73.59	x	0.63	x	0.7	=	72.42	(76)
East	0.9x	0.77	x	1.61	x	45.59	x	0.63	x	0.7	=	44.86	(76)
East	0.9x	0.77	X	1.61	x	45.59	x	0.63	X	0.7	=	44.86	(76)
East	0.9x	0.77	X	1.61	x	24.49	x	0.63	X	0.7	=	24.1	(76)
East	0.9x	0.77	x	1.61	x	24.49	X	0.63	X	0.7	=	24.1	(76)
East	0.9x	0.77	X	1.61	X	16.15	X	0.63	X	0.7	=	15.89	(76)
East	0.9x	0.77	x	1.61	x	16.15	х	0.63	x	0.7	=	15.89	(76)
South	0.9x	0.77	x	1.18	х	46.75	×	0.63	x	0.7	=	16.86	(78)
South	0.9x	0.77	x	1.18	x	76.57	x	0.63	x	0.7	=	27.61	(78)
South	0.9x	0.77	x	1.18	x	97.53	Х	0.63	x	0.7	=	35.17	(78)
South	0.9x	0.77	x	1.18	x	110.23	X	0.63	x	0.7	=	39.75	(78)
South	0.9x	0.77	x	1.18	х	114.87	x	0.63	x	0.7	=	41.43	(78)
South	0.9x	0.77	X	1.18	x	110.55	x	0.63	X	0.7	=	39.87	(78)
South	0.9x	0.77	X	1.18	x	108.01	x	0.63	X	0.7	=	38.95	(78)
South	0.9x	0.77	X	1.18	x	104.89	x	0.63	X	0.7	=	37.83	(78)
South	0.9x	0.77	X	1.18	x	101.89	x	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	x	1.18	x	82.59	x	0.63	x	0.7	=	29.78	(78)
South	0.9x	0.77	x	1.18	x	55.42	x	0.63	x	0.7	=	19.98	(78)
South	0.9x	0.77	X	1.18	x	40.4	x	0.63	X	0.7	=	14.57	(78)
West	0.9x	0.77	x	2.55	x	19.64	X	0.63	X	0.7	=	15.31	(80)
West	0.9x	0.77	x	3.17	x	19.64	x	0.63	X	0.7	=	19.03	(80)
West	0.9x	0.77	x	2.55	x	38.42	X	0.63	X	0.7	=	29.94	(80)
West	0.9x	0.77	x	3.17	x	38.42	X	0.63	X	0.7	=	37.22	(80)
West	0.9x	0.77	x	2.55	x	63.27	x	0.63	x	0.7	=	49.31	(80)
West	0.9x	0.77	x	3.17	x	63.27	х	0.63	x	0.7	=	61.3	(80)
West	0.9x	0.77	x	2.55	x	92.28	x	0.63	x	0.7	j =	71.92	(80)
West	0.9x	0.77	x	3.17	x	92.28	x	0.63	x	0.7	j =	89.4	(80)
West	0.9x	0.77	x	2.55	x	113.09	x	0.63	x	0.7] =	88.13	(80)
West	0.9x	0.77	x	3.17	x	113.09	x	0.63	x	0.7] =	109.56	(80)
	_		•		•		•				-		-

West	0.9x	0.77	X	2.5	55	x	11	15.77	X	0.63	3	x	0.7	=		90.22	(80)
West	0.9x	0.77	X	3.1	7	X	11	15.77	X	0.63	3	x	0.7	-		112.16	(80)
West	0.9x	0.77	X	2.5	55	X	11	10.22	X	0.63	3	X	0.7	=	- [85.89	(80)
West	0.9x	0.77	X	3.1	7	X	11	10.22	X	0.63	3	x	0.7	=	• [106.78	(80)
West	0.9x	0.77	X	2.5	55	X	9	4.68	X	0.63	3	x	0.7	=	- [73.78	(80)
West	0.9x	0.77	X	3.1	7	X	9	4.68	X	0.63	3	x	0.7	=	- [91.72	(80)
West	0.9x	0.77	X	2.5	55	X	7	3.59	X	0.63	3	x	0.7		- [57.35	(80)
West	0.9x	0.77	X	3.1	7	X	7	'3.59	X	0.63	3	x	0.7	=	- [71.29	(80)
West	0.9x	0.77	X	2.5	55	X	4	5.59	X	0.63	3	x	0.7	=		35.53	(80)
West	0.9x	0.77	X	3.1	7	x	4	5.59	X	0.63	3	x	0.7	=	• [44.17	(80)
West	0.9x	0.77	X	2.5	55	X	2	4.49	X	0.63	3	x	0.7	=	• [19.08	(80)
West	0.9x	0.77	X	3.1	7	X	2	4.49	X	0.63	3	x	0.7	=	• [23.72	(80)
West	0.9x	0.77	X	2.5	55	X	1	6.15	X	0.63	3	x	0.7	=	- [12.59	(80)
West	0.9x	0.77	X	3.1	7	X	1	6.15	X	0.63	3	x	0.7	=	• [15.65	(80)
Solar ga		watts, cal			n month	1			` 	= Sum(74	4)m(82)m			_		
(83)m=	89.85		270.31	382.69	461.71		70.1	448.55	389.	67 310	.22	199.2	110.99	74.59			(83)
Ĭг		nternal an				-									7		(0.1)
(84)m=	489.45	568.01	655.24	747.15	805.44	79	93.79	759.17	706.	01 637	.03 5	546.68	482.23	463.6			(84)
7. Mea	ın inter	nal tempe	erature (heating	seasor	า)											
Tempe	erature	during he	ating pe	eriods ir	the livi	ing	area f	from Tab	ole 9,	Th1 (°C	C)					21	(85)
Utilisat	ion fac	tor for goi															
	ion rac	ioi ioi gai	ins for li	ving are	ea, h1,m	n (s	ee Ta	ble 9a)									
	Jan	Feb	Mar	ving are Apr	ea, h1,m May	<u> </u>	ee Ta Jun	ble 9a) Jul	Au	ıg S	ер	Oct	Nov	Dec	_ []		
(86)m=									Au 0.4	_		Oct 0.96	Nov 0.99	Dec	;		(86)
(86)m=	Jan 1	Feb	Mar 0.98	Apr 0.92	May 0.79		Jun 0.6	Jul 0.44	0.4	9 0.7	76	_	_		;		(86)
(86)m=	Jan 1	Feb 0.99	Mar 0.98	Apr 0.92	May 0.79	ollo	Jun 0.6	Jul 0.44	0.4	9 0.7 able 9c)	76	_	_				(86)
(86)m= Mean i (87)m=	Jan 1 interna 19.91	Feb 0.99 I tempera	0.98 ture in li 20.34	Apr 0.92 iving are 20.67	0.79 ea T1 (f	follo 2	Jun 0.6 ow ste 20.98	Jul 0.44 ps 3 to 7 21	0.4 7 in T 20.9	9 0.7 able 9c)	94	0.96	0.99	1			
(86)m= Mean i (87)m=	Jan 1 interna 19.91	0.99 I tempera 20.07	0.98 ture in li 20.34	Apr 0.92 iving are 20.67	0.79 ea T1 (f	f dw	Jun 0.6 ow ste 20.98	Jul 0.44 ps 3 to 7 21	0.4 7 in T 20.9	9 0.7 able 9c) 99 20. 7, Th2 (°	94 :	0.96	0.99	1			
(86)m= Mean i (87)m= Tempe (88)m=	Jan 1 interna 19.91 erature 20.01	Feb 0.99 I tempera 20.07 during he 20.02	Mar 0.98 ture in li 20.34 eating pe	Apr 0.92 iving are 20.67 eriods in 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03	f dw	Jun 0.6 www.ste 20.98 velling 20.04	Jul 0.44 ps 3 to 7 21 from Ta 20.04	0.47 in T 20.9 able 9 20.0	9 0.7 able 9c) 99 20. 7, Th2 (°	94 :	0.96 20.63	0.99	19.88			(87)
(86)m= Mean i (87)m= Tempe (88)m=	Jan 1 interna 19.91 erature 20.01	Feb 0.99 I tempera 20.07 during he	Mar 0.98 ture in li 20.34 eating pe	Apr 0.92 iving are 20.67 eriods in 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03	f dw	Jun 0.6 www.ste 20.98 velling 20.04	Jul 0.44 ps 3 to 7 21 from Ta 20.04	0.47 in T 20.9 able 9 20.0	9 0.7 able 9c) 99 20.), Th2 (°	94 : C)	0.96 20.63	0.99	19.88			(87)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m=	Jan 1 Interna 19.91 Prature 20.01 Ion fac	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do	May 0.79 ea T1 (f 20.89 o rest of 20.03 welling, 0.74	f dw 2 h2,	Jun 0.6 w ste 20.98 velling 20.04 m (se 0.52	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35	0.4 7 in T 20.9 able 9 20.0 9a) 0.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20.	94 : C) 04 :	0.96 20.63 20.03	20.21	19.88			(87)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i	Jan 1 Interna 19.91 Prature 20.01 Ition factor 1 Interna	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99 I tempera	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell	f dw 2 h2,	Jun 0.6 www.ste 20.98 velling 20.04 mm (sec 0.52	Jul 0.44 ps 3 to 7 21 from Ta 20.04 pe Table 0.35 pollow ste	0.4 7 in T 20.9 able 9 20.0 9a) 0.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6	94 : C) 04 : S8	0.96 20.63 20.03 0.94 9c)	20.21	1 19.88 20.02			(87) (88) (89)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m=	Jan 1 Interna 19.91 Prature 20.01 Ion fac	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do	May 0.79 ea T1 (f 20.89 o rest of 20.03 welling, 0.74	f dw 2 h2,	Jun 0.6 w ste 20.98 velling 20.04 m (se 0.52	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35	0.4 7 in T 20.9 able 9 20.0 9a) 0.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6	94 : C) 004 : Fable 99	0.96 20.63 20.03 0.94 9c) 19.61	0.99 20.21 20.03 0.99	1 19.88 20.02 1 18.53		0.37	(87) (88) (89) (90)
(86)m=	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93	f dw 2 h2, (Jun 0.6 w ste 20.98 velling 20.04 m (se 0.52 T2 (fo	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19.	94 : C) 04 : Fable 99	0.96 20.63 20.03 0.94 9c) 19.61	20.21	1 19.88 20.02 1 18.53		0.37	(87) (88) (89)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m=	Jan 1 Interna 19.91 erature 20.01 ion fac 1 interna 18.56	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99 I tempera 18.8	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93	f dw 2 h2, (Jun 0.6 www.ste 20.98 velling 20.04 m (se 0.52 T2 (fo 20.03	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 10 7 in 7 04 19.	76 94 : C) 004 : 58 Γable 99 fLA	0.96 20.63 20.03 0.94 9c) 19.61	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4	1 19.88 20.02 1 18.53		0.37	(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m=	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56 Interna 19.06	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97 ture in t 19.19 ture (for	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwell 20.28	h2, (b) c) d) d) d) d) d) d) d) d) d) d) d) d) d)	Jun 0.6 ow ste 20.98 relling 20.04 m (se 0.52 T2 (fo 20.03	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow ste 20.04 LA × T1 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 10 7 in 104 19. - fLA) × 39 20.	94 : C) 04 : Γable 99 fLA	0.96 20.63 20.03 0.94 9c) 19.61 19.98	0.99 20.21 20.03 0.99	1 19.88 20.02 1 18.53		0.37	(87) (88) (89) (90)
Mean i (86)m= Mean i (87)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56 Interna 19.06 adjustn	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 nent to the	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19 ture (for	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwe 20.28 temper	follo 2 f dw 2 h2, () () Eilling 2 zeratu	Jun 0.6 www.ste 20.98 velling 20.04 m (se 20.03 g) = fl 20.38 ure fro	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1 20.39 m Table	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3 e 4e, 1	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 10 7 in 7 04 19.	76 94 : C) 04 : S8 Γable 99 fLA T2 34 pprop	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4	1 19.88 20.02 1 18.53 4) =		0.37	(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m=	Jan 1 1 19.91 erature 20.01 cion factor 1 18.56 enterna 19.06 adjustn 19.06	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97 ture in tr 19.19 ture (for 19.61 e mean 19.61	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwell 20.28	follo 2 f dw 2 h2, () () Eilling 2 zeratu	Jun 0.6 ow ste 20.98 relling 20.04 m (se 0.52 T2 (fo 20.03	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow ste 20.04 LA × T1 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 10 7 in 7 04 19.	76 94 : C) 04 : S8 Γable 99 fLA T2 34 pprop	0.96 20.63 20.03 0.94 9c) 19.61 19.98	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4	1 19.88 20.02 1 18.53		0.37	(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Span	Jan 1 Interna 19.91 erature 20.01 ion fac 1 interna 18.56 interna 19.06 adjustn 19.06 ce hea	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the 19.27 ting requi	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19 ture (for 19.61 e mean 19.61 rement	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwe 20.28 temper 20.28	follo 2 f dw 2 h2, (ling 2 elling 2	Jun 0.6 www.ste 20.98 velling 20.04 mr (se 20.03 g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1 20.39 m Table 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0 2 4e, v 20.0	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19.	76 94 : C) 04 : S8 Fable 99 1LA 12 13 14 15 15 15 15 15 15 15	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4) 19.45	1 19.88 20.02 1 18.53 4) =			(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Spar	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56 Interna 19.06 adjustn 19.06 ce head to the i	Feb 0.99 I tempera 20.07 during he 20.02 etor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97 ture in tr 19.19 ture (for 19.61 e mean 19.61 rement rement	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwe 20.28 temper 20.28	follo 2 f dw 2 h2, (ling 2 elling 2	Jun 0.6 www.ste 20.98 velling 20.04 mr (se 20.03 g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1 20.39 m Table 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0 2 4e, v 20.0	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19.	76 94 : C) 04 : S8 Fable 99 1LA 12 13 14 15 15 15 15 15 15 15	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4) 19.45	1 19.88 20.02 1 18.53 4) =			(87) (88) (89) (90) (91)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Spar	Jan 1 Interna 19.91 Prature 20.01 Interna 18.56 Interna 19.06 adjustn 19.06 ce head to the i	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the 19.27 ting requi mean inte	Mar 0.98 ture in li 20.34 eating per 20.02 ins for re 0.97 ture in tr 19.19 ture (for 19.61 e mean 19.61 rement rement	Apr 0.92 iving are 20.67 eriods in 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwe 20.28 temper 20.28	follo 2 f dw 2 h2, h2, culting 2 raturaturaturaturaturaturaturaturaturatu	Jun 0.6 www.ste 20.98 velling 20.04 mr (se 20.03 g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 ollow ste 20.04 LA × T1 20.39 m Table 20.39	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.0 2 4e, v 20.0	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19	76 94 : C) 04 : S8 Fable 99 1LA 12 13 14 15 15 15 15 15 15 15	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4) 19.45	1 19.88 20.02 1 18.53 4) =			(87) (88) (89) (90) (91)
Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= 8. Spat Set Ti the util	Jan 1 Interna 19.91 erature 20.01 Iion fac 1 Interna 18.56 Interna 19.06 adjustn 19.06 ce head to the isation Jan	Teb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 nent to the 19.27 ting requi mean inte factor for	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19 ture (for 19.61 e mean 19.61 rement rnal tem gains u Mar	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03 enperaturising Ta	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwe 20.28 temper 20.28 re obtainable 9a	follo 2 f dw 2 h2, h2, culting 2 raturaturaturaturaturaturaturaturaturatu	Jun 0.6 www.ste 20.98 velling 20.04 mm (se 0.52 T2 (fo 20.03) g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow ste 20.04 LA × T1 20.39 m Table 20.39 ep 11 of	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3 4 4e, v 20.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19	94 : C) 04 : 68 Γable 99 ΓLA Τ2 34 Γρργορ 34 Γhat	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98 Γi,m=	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4 19.45 19.45	1 19.88 20.02 1 18.53 1) = 19.03			(87) (88) (89) (90) (91)
Mean i (86)m= Mean i (87)m= Utilisat (89)m= Mean i (90)m= Apply a (93)m= 8. Spa Set Ti the util	Jan 1 Interna 19.91 erature 20.01 Iion fac 1 Interna 18.56 Interna 19.06 adjustn 19.06 ce head to the isation Jan	Feb 0.99 I tempera 20.07 during he 20.02 ctor for gai 0.99 I tempera 18.8 I tempera 19.27 ment to the 19.27 ting requi mean inte factor for	Mar 0.98 ture in li 20.34 eating pe 20.02 ins for re 0.97 ture in t 19.19 ture (for 19.61 e mean 19.61 rement rnal tem gains u Mar	Apr 0.92 iving are 20.67 eriods ir 20.03 est of do 0.9 he rest 19.65 r the wh 20.03 internal 20.03 enperaturising Ta	May 0.79 ea T1 (f 20.89 n rest of 20.03 welling, 0.74 of dwell 19.93 ole dwe 20.28 temper 20.28 re obtainable 9a	folloo 2 f dw 2 h2, h2, culting 2 rature 2 nned	Jun 0.6 www.ste 20.98 velling 20.04 mm (se 0.52 T2 (fo 20.03) g) = fl 20.38 ure fro 20.38	Jul 0.44 ps 3 to 7 21 from Ta 20.04 ee Table 0.35 collow ste 20.04 LA × T1 20.39 m Table 20.39 ep 11 of	0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3 4 4e, v 20.3	9 0.7 able 9c) 99 20. 0, Th2 (° 05 20. 9 0.6 to 7 in 7 04 19 fLA) × 39 20. where a 39 20. e 9b, so	94 : C) 04 : 68 Γable 99 Γ12 34 pprop 34 that 1	0.96 20.63 20.03 0.94 9c) 19.61 19.98 riate 19.98 Γi,m=	0.99 20.21 20.03 0.99 19.01 ing area ÷ (4 19.45 19.45	1 19.88 20.02 1 18.53 1) = 19.03			(87) (88) (89) (90) (91)

Useful gains, hmGm , W = (94	4)m v (94)m									
(95)m= 486.61 560.75 632.86	671.45 608.24	435.85	290.7	304.48	450.78	512.21	476.27	461.53		(95)
Monthly average external tem			290.7	304.40	430.76	312.21	470.27	401.33		(00)
(96)m= 4.3 4.9 6.5	8.9 11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean intern	nal temperature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1175.76 1141.44 1038.55	 	444.5	291.71	306.35	482.09	730.72	966.92	1167.55		(97)
Space heating requirement fo	or each month, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m	<u>.</u>		
(98)m= 512.73 390.23 301.83	142.06 44.79	0	0	0	0	162.57	353.27	525.28		
			•	Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2432.76	(98)
Space heating requirement in	kWh/m²/year								33.14	(99)
9a. Energy requirements – Ind	ividual heating s	ystems i	ncluding	micro-C	CHP)					
Space heating:								_		_
Fraction of space heat from s	econdary/supple	ementary	system						0	(201)
Fraction of space heat from m	nain system(s)			(202) = 1	- (201) =				1	(202)
Fraction of total heating from	main system 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heat	ing system 1								93.5	(206)
Efficiency of secondary/suppl	ementary heatin	g systen	า, %						0	(208)
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (c	calculated above	:)								
512.73 390.23 301.83	142.06 44.79	0	0	0	0	162.57	353.27	52 5.28		
$(211)m = \{[(98)m \times (204)]\} \times 1$	100 ÷ (206)									(211)
548.37 417.35 322.82	151.94 47.9	0	0	0	0	173.87	377.83	561.8		
				Tota	kWh/yea	ar) =Sum(2	211),15,1012	=	2601.88	(211)
Space heating fuel (secondar	y), kWh/month							•		_
= {[(98)m x (201)]} x 100 \div (20	08)									
(215)m = 0 0 0	0 0	0	0	0	0	0	0	0		
				Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating										_
Output from water heater (calc		1						î l		
192.49 169.69 178.27	159.89 156.74	140.14	134.67	147.67	147.37	165.79	175.2	187.89		٦
Efficiency of water heater		1	ı						79.8	(216)
(217)m= 87.3 86.97 86.21	84.5 81.95	79.8	79.8	79.8	79.8	84.76	86.65	87.41		(217)
Fuel for water heating, kWh/mo (219) m = (64) m x $100 \div (217)$										
(219) m = 220.48	189.21 191.26	175.62	168.76	185.04	184.67	195.6	202.2	214.94		
		·		Tota	I = Sum(2	19a) ₁₁₂ =	!		2329.7	(219)
Annual totals						k\	Wh/year		kWh/year	
Space heating fuel used, main	system 1								2601.88	
Water heating fuel used								Ţ	2329.7	Ī
Electricity for pumps, fans and	electric keep-ho	ot						L		_
central heating pump:								30		(230c)

boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting				323.47	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	562.01	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	503.22	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1065.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)

(232) x

TER = 25.31 (273)

0.519

sum of (265)...(271) =

Electricity for lighting

Total CO2, kg/year

(268)

(272)

167.88

1272.03

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Vorsio	on: 1.0.4.26	
Software Name.		roperty	Address:				VCISIC	71. 1.0.4.20	
Address :	The Charlie Ratchford Cent					V1 8HF			
1. Overall dwelling dime	nsions:								
		Area	a(m²)		Av. He	ight(m)	_	Volume(m ³	<u>')</u>
Ground floor			50	(1a) x	2	2.8	(2a) =	140	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1r	n)	50	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	140	(5)
2. Ventilation rate:									
	main secondar heating heating	У	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	ns				0	X ·	10 =	0	(7a)
Number of passive vents					0	x	10 =	0	(7b)
Number of flueless gas fin	res			Ī	0	X 4	40 =	0	(7c)
				_			Δir ch	nanges per ho	——
	(Co) (Ch) (C	70) ((7b) ((75)	_		_			_
	vs, flues and fans = $(6a)+(6b)+(7a)$ een carried out or is intended, procee			ontinue fr	0 rom (9) to (÷ (5) =	0	(8)
Number of storeys in the			0.1.101.11.100.0		(0) (0)	. 5)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame or			•	uction			0	(11)
if both types of wall are pr deducting areas of openin	esent, use the value corresponding to	the great	ter wall area	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -					0	(16)
•	q50, expressed in cubic metre	•	•	•	etre of e	nvelope	area	3	(17)
·	ity value, then $(18) = [(17) \div 20] + (18)$ is if a pressurisation test has been don				ia haina	a a d		0.15	(18)
Number of sides sheltere		ie or a deg	gree all per	теаршу	is being us	seu		2	(19)
Shelter factor	-		(20) = 1 - [0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified for	or monthly wind speed								_
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22									
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
		L			<u> </u>	<u> </u>		ı	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effec		_	rate for t	he appli	cable ca	se			l				
If mechanica												0.5	(23
If exhaust air he) = (23a)			0.5	(23
If balanced with		•	-	_								76.5	(2:
a) If balance								<u> </u>	`		- ` ´	÷ 100]	
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(24
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n				•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)m					•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
3. Heat losse	s and he	eat loss r	naramete	or.					_				
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U	K)	k-value		A X k kJ/K
Doors Type 1					2.5	x	1.3	_ =	3.25	$\stackrel{\prime}{\Box}$			(2
Doors Type 2					2.5	X	1	=\=	2.5	Ħ			(2
Windows Type	: 1				1.3	7 x1	/[1/(1.3)+	0.04] =	1.61	Ħ			(2
Vindows Type					2.6		/[1/(1.3)+		3.21	4			(2
Vindows Type					1.9	=	/[1/(1.3)+		2.35	=			(2
Vindows Type							/[1/(1.3)+			=			`
					4.1		/[1/(1.3)+		5.07	=			(2
Vindows Type					2.6	=		—, ¦	3.21	ᆗ ,			(2
Valls	67.7		17.5		50.26	=	0.15	=	7.54				(2
Total area of e			· ((1'		67.76		. (/F/4/11) 0.047				(3
for windows and it include the area						atea using	i tormula 1	/[(1/ U- vail	ie)+0.04j a	as given in	paragrapr	1 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				28.74	(3
leat capacity	Cm = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(3
Thermal mass	parame	ter (TMF	c = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
For design assess can be used instea				construct	ion are no	t known pi	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						3.38	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			32.12	(3
entilation hea		alculated	d monthly	/						(25)m x (5))	J2.12	,``
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 12.94	12.79	12.64	11.91	11.76	11.02	11.02	10.88	11.32	11.76	12.06	12.35		(3
leat transfer o			!		I	I			= (37) + (ı	
.out training C			14.00	42.00	43.15	42.45	T 42			1	1 44 47	1	
39)m= 45.06	44.91	44.77	44.03	43.88	4.5.15	43.15	43	43.44	43.88	44.18	44.47		

Heat loss pa	rameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.9	0.9	0.9	0.88	0.88	0.86	0.86	0.86	0.87	0.88	0.88	0.89		
				l .		l .	l .		Average =	Sum(40) ₁	12 /12=	0.88	(40)
Number of da	-	nth (Tab	le 1a)					ı					
Jan	+	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water he	ating ene	rgy requ	irement:								kWh/ye	ar:	
Assumed occif TFA > 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		69		(42)
Annual avera Reduce the ann not more that 12	ual average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.34		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
(44)m= 81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77		
		•				•				m(44) ₁₁₂ =		892.08	(44)
Energy content	of hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 121.27	7 106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44		_
If instantaneous	water heat	ng at nain	of use (no	hot water	r etorago)	ontor () in	haves (46		Total = Su	m(45) ₁₁₂ =		1169.66	(45)
				_		_					1- 22		(40)
(46)m= 18.19 Water storag		16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62		(46)
Storage volu		includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		150		(47)
If community													` '
Otherwise if	_			_			, ,	ers) ente	er '0' in ((47)			
Water storag													
a) If manufa	cturer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	63		(48)
Temperature	factor fro	m Table	2b							0	.6		(49)
Energy lost f		_	-				(48) x (49)) =		0.	98		(50)
b) If manufaHot water sto			-										(51)
If community	•			ie z (KVV)	ii/iiti G/GC	, y)					0		(31)
Volume factor	_										0		(52)
Temperature	factor fro	m Table	2b								0		(53)
Energy lost f	om wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) o	(54) in (55)								0.	98		(55)
Water storag	e loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(56)
If cylinder contain		d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5		7)m = (56)	m where (m Appendi	хH	
(57)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(57)
Primary circu	it loss (ar	nnual) fro	m Table	 - 3							0		(58)
Primary circu	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss	calculated	for each	month	(61)m -	(60) · '	265 v (41	\m							
(61)m= 0	0 0	0	0	01)111 =	00) + \	0 7 (41) 0	0	0	T 0	0	1	(61)	
												J (59)m + (61)m	(-)	
(62)m= 174.8		163.03	147.27	145.14	130.86		137.5		152.66	ì ´	171.02]	(62)	
Solar DHW inp				<u> </u>								J	(-)	
(add addition									ar contino	morrio wan	or riodiirig)			
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)	
Output from	water hea	ter	<u> </u>	<u> </u>	<u> </u>	·	<u> </u>		<u> </u>	·	ļ	J		
(64)m= 174.8		163.03	147.27	145.14	130.86	126.79	137.5	9 136.87	152.66	160	171.02	1		
		!	l	!		1	C	output from v	vater heat	er (annual)	112	1800.52	(64)	
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (61)m] + 0.8	x [(46)n	n + (57)m	+ (59)m]	_	
(65)m= 83.1		79.26	73.21	73.31	67.75	67.21	70.8		75.81	77.44	81.91]	(65)	
include (5	7)m in cal	culation (of (65)m	only if c	ylinder	is in the	dwellir	ng or hot v	vater is	from com	munity h	neating		
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):														
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts														
Jar		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]		
(66)m= 84.5	1 84.51	84.51	84.51	84.51	84.51	84.51	84.5	84.51	84.51	84.51	84.51		(66)	
Lighting gair	ns (calcula	ted in Ap	pendix	L, equ <mark>at</mark>	ion L9	or L9a), a	lso se	e Table 5						
(67)m= 13.1	3 11.66	9.48	7.18	5.37	4.53	4.89	6.36	8.54	10.84	12.66	13.49		(67)	
Appliances	gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation	_13 or L1	3a), a	lso see Ta	able 5					
(68)m= 147.2	23 148.76	144.91	136.72	126.37	116.64	110.15	108.6	2 112.47	120.67	131.01	140.74		(68)	
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L1	or L15a), also	see Table	e 5			·		
(69)m= 31.4	5 31.45	31.45	31.45	31.45	31.45	31.45	31.4	5 31.45	31.45	31.45	31.45		(69)	
Pumps and	fans gains	(Table 5	Ба)							•	•	• —		
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)	
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•		•		•	•	•		
(71)m= -67.6	6 -67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	6 -67.6	-67.6	-67.6	-67.6]	(71)	
Water heating	ng gains (1	able 5)				•		-	-	•		•		
(72)m= 111.8	110.09	106.53	101.68	98.53	94.1	90.33	95.1	6 96.87	101.89	107.56	110.1]	(72)	
Total intern	al gains =				(6	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	-		
(73)m= 320.5	318.86	309.27	293.92	278.62	263.62	253.73	258.4	9 266.23	281.75	299.58	312.68]	(73)	
6. Solar ga	ins:													
Solar gains ar	e calculated	using sola	r flux from	Table 6a		•	tions to	convert to t	he applica		tion.			
Orientation:	Access F Table 6d		Area m²			ux able 6a		g_ Table 6b	_	FF Fable 6c		Gains		
_					- 1	able ba	, –	Table of	<u> </u>	able 60		(W)	,	
East 0.9		X	2.	6	X	19.64	X	0.53	x [0.7	=	13.13	(76)	
East 0.9		X	4.	1	X	19.64	X	0.53	×	0.8	=	23.66	(76)	
East 0.9	× 0.77	X	2.	6	x	38.42	X	0.53	x	0.7	=	25.68	(76)	
East 0.9		X	4.	1	x	38.42	X	0.53	×	0.8	=	46.29	(76)	
East 0.9	× 0.77	X	2.	6	x	63.27	x	0.53	X	0.7	=	42.3	(76)	

	_												_
East	0.9x	0.77	X	4.1	X	63.27	X	0.53	X	0.8	=	76.23	(76)
East	0.9x	0.77	x	2.6	x	92.28	x	0.53	X	0.7	=	61.69	(76)
East	0.9x	0.77	X	4.1	X	92.28	X	0.53	X	0.8	=	111.17	(76)
East	0.9x	0.77	X	2.6	X	113.09	x	0.53	X	0.7	=	75.6	(76)
East	0.9x	0.77	X	4.1	X	113.09	X	0.53	X	0.8	=	136.24	(76)
East	0.9x	0.77	X	2.6	X	115.77	x	0.53	X	0.7	=	77.39	(76)
East	0.9x	0.77	x	4.1	x	115.77	X	0.53	X	0.8	=	139.47	(76)
East	0.9x	0.77	x	2.6	x	110.22	x	0.53	X	0.7	=	73.68	(76)
East	0.9x	0.77	X	4.1	X	110.22	x	0.53	X	0.8	=	132.78	(76)
East	0.9x	0.77	x	2.6	x	94.68	x	0.53	X	0.7	=	63.29	(76)
East	0.9x	0.77	x	4.1	x	94.68	x	0.53	X	0.8	=	114.06	(76)
East	0.9x	0.77	x	2.6	x	73.59	x	0.53	X	0.7	=	49.19	(76)
East	0.9x	0.77	x	4.1	x	73.59	x	0.53	x	0.8	=	88.65	(76)
East	0.9x	0.77	x	2.6	x	45.59	x	0.53	x	0.7	=	30.47	(76)
East	0.9x	0.77	x	4.1	x	45.59	x	0.53	X	0.8	=	54.92	(76)
East	0.9x	0.77	x	2.6	x	24.49	x	0.53	X	0.7	=	16.37	(76)
East	0.9x	0.77	x	4.1	x	24.49	x	0.53	x	0.8	=	29.5	(76)
East	0.9x	0.77	x	2.6	X	16.15	Х	0.53	X	0.7	=	10.8	(76)
East	0.9x	0.77	x	4.1	x	16.15	x	0.53	x	0.8	=	19.46	(76)
South	0.9x	0.77	x	1.3	х	46.75	×	0.53	x	0.7	=	15.63	(78)
South	0.9x	0.77	x	1.3	x	76.57	x	0.53	x	0.7	=	25.59	(78)
South	0.9x	0.77	x	1.3	x	97.53	Х	0.53	x	0.7	=	32.6	(78)
South	0.9x	0.77	x	1.3	x	110.23	X	0.53	x	0.7	=	36.84	(78)
South	0.9x	0.77	x	1.3	х	114.87	x	0.53	x	0.7	=	38.39	(78)
South	0.9x	0.77	x	1.3	x	110.55	x	0.53	X	0.7	=	36.95	(78)
South	0.9x	0.77	x	1.3	x	108.01	x	0.53	X	0.7	=	36.1	(78)
South	0.9x	0.77	x	1.3	x	104.89	x	0.53	X	0.7	=	35.06	(78)
South	0.9x	0.77	x	1.3	x	101.89	x	0.53	X	0.7	=	34.05	(78)
South	0.9x	0.77	x	1.3	x	82.59	x	0.53	x	0.7	=	27.6	(78)
South	0.9x	0.77	x	1.3	x	55.42	x	0.53	X	0.7	=	18.52	(78)
South	0.9x	0.77	x	1.3	x	40.4	x	0.53	X	0.7	=	13.5	(78)
West	0.9x	0.77	x	1.9	x	19.64	x	0.53	X	0.8	=	10.96	(80)
West	0.9x	0.77	x	2.6	x	19.64	x	0.53	X	0.8	=	15	(80)
West	0.9x	0.77	x	1.9	x	38.42	x	0.53	X	0.8	=	21.45	(80)
West	0.9x	0.77	x	2.6	x	38.42	x	0.53	X	0.8	=	29.35	(80)
West	0.9x	0.77	x	1.9	x	63.27	x	0.53	X	0.8	=	35.32	(80)
West	0.9x	0.77	x	2.6	x	63.27	x	0.53	x	0.8	=	48.34	(80)
West	0.9x	0.77	x	1.9	x	92.28	x	0.53	x	0.8	=	51.52	(80)
West	0.9x	0.77	x	2.6	x	92.28	x	0.53	x	0.8	=	70.5	(80)
West	0.9x	0.77	х	1.9	x	113.09	x	0.53	x	0.8	=	63.14	(80)
West	0.9x	0.77	х	2.6	x	113.09	x	0.53	X	0.8	=	86.4	(80)

West	0.9x	0.77	X	1.9		x	115.77	x	0.53	X	0.8	=	64.63	(80)
West	0.9x	0.77	X	2.6	5	x	115.77	x	0.53	x	0.8	=	88.44	(80)
West	0.9x	0.77	X	1.9)	x	110.22	x	0.53	X	0.8	=	61.53	(80)
West	0.9x	0.77	X	2.6	5	x	110.22	X	0.53	X	0.8	=	84.2	(80)
West	0.9x	0.77	X	1.9)	x	94.68	x	0.53	X	0.8	=	52.86	(80)
West	0.9x	0.77	X	2.6	5	x	94.68	x	0.53	X	0.8	=	72.33	(80)
West	0.9x	0.77	X	1.9)	x [73.59	x	0.53	X	0.8	=	41.08	(80)
West	0.9x	0.77	X	2.6	5	x	73.59	x	0.53	X	0.8	=	56.22	(80)
West	0.9x	0.77	X	1.9)	x	45.59	X	0.53	X	0.8	=	25.45	(80)
West	0.9x	0.77	Х	2.6	5	x	45.59	x	0.53	X	0.8	=	34.83	(80)
West	0.9x	0.77	X	1.9)	x	24.49	X	0.53	X	0.8	=	13.67	(80)
West	0.9x	0.77	X	2.6	;	x	24.49	x	0.53	X	0.8	=	18.71	(80)
West	0.9x	0.77	X	1.9)	x	16.15	x	0.53	X	0.8	=	9.02	(80)
West	0.9x	0.77	Х	2.6	5	x	16.15	X	0.53	X	0.8	=	12.34	(80)
Solar g	ains in	watts, ca	lculated	for each	month			(83)m	= Sum(74)m .	(82)m			1	
(83)m=	78.39	148.36	234.78	331.72	399.77	406		337.	59 269.2	173.28	96.78	65.11		(83)
				` '	• •		B)m , watts		1				1	(0.4)
(84)m=	398.91	467.23	544.05	625.64	678.39	670	642.02	596.	08 535.44	455.03	396.35	377.79		(84)
7. Me	an inter	nal tempe	erature ((hea <mark>ting</mark>	season)					_			
Temp	erature	during he	eating p	eriods in	the livi	ng ar	rea from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisa	ation fac	ctor for ga	ins for li	iving are	a, h1,m	(see	e Table 9a)						,	<u>-</u>
Utilisa	Jan	tor for ga	ins for li Mar	iving are Apr	a, h1,m May	<u> </u>	e Table 9a) un Jul	Αι	ıg Sep	Oct	Nov	Dec		
Utilisa (86)m=		Ī			$\overline{}$	<u> </u>	un Jul	Au 0.33		Oct 0.86	Nov 0.98	Dec 0.99		(86)
(86)m=	Jan 0.99	Feb 0.97	Mar 0.92	Apr 0.78	May 0.59	Ju 0.4	un Jul	0.33	3 0.55	_	_			(86)
(86)m=	Jan 0.99	Feb 0.97	Mar 0.92	Apr 0.78	May 0.59	Ju 0.4	un Jul 41 0.3 2 steps 3 to 7	0.33	0.55 able 9c)	_	0.98			(86)
(86)m= Mean (87)m=	Jan 0.99 interna 20.3	Feb 0.97 Il tempera 20.47	Mar 0.92 ature in I 20.71	Apr 0.78 iving are 20.92	0.59 ea T1 (fo	Ju 0.4 ollow 2	un Jul 41 0.3 2 steps 3 to 7	0.33 7 in Ta 21	3 0.55 able 9c) 20.99	0.86	0.98	0.99		` ,
(86)m= Mean (87)m=	Jan 0.99 interna 20.3	Feb 0.97 Il tempera 20.47	Mar 0.92 ature in I 20.71	Apr 0.78 iving are 20.92	0.59 ea T1 (fo	Ju 0.4 ollow 2	un Jul 41 0.3 4 steps 3 to 7 4 21 Illing from Ta	0.33 7 in Ta 21	3 0.55 able 9c) 20.99 , Th2 (°C)	0.86	0.98	0.99		` ,
(86)m= Mean (87)m= Temp (88)m=	Jan 0.99 interna 20.3 erature 20.17	Feb 0.97 Il tempera 20.47 during he 20.17	Mar 0.92 ature in I 20.71 eating po	Apr 0.78 iving are 20.92 eriods in 20.18	May 0.59 ea T1 (fo 20.99 rest of 20.19	Ju 0.4 ollow 2 dwel 20	un Jul 41 0.3 2 steps 3 to 7 1 21 Illing from Ta .2 20.2	0.33 7 in Ta 21 able 9 20.2	3 0.55 able 9c) 20.99 , Th2 (°C)	20.87	0.98	0.99		(87)
(86)m= Mean (87)m= Temp (88)m=	Jan 0.99 interna 20.3 erature 20.17	Feb 0.97 Il tempera 20.47 during he 20.17	Mar 0.92 ature in I 20.71 eating po	Apr 0.78 iving are 20.92 eriods in 20.18	May 0.59 ea T1 (fo 20.99 rest of 20.19	Ju 0.4 ollow 2 dwel 20	un Jul 41 0.3 2 steps 3 to 7 1 21 3 steps 3 to 7 2 20.2 3 (see Table	0.33 7 in Ta 21 able 9 20.2	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19	20.87	0.98	0.99		(87)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	Jan 0.99 interna 20.3 erature 20.17 ation fac	Feb 0.97 Il tempera 20.47 during he 20.17 eter for ga 0.97	Mar 0.92 ature in I 20.71 eating por 20.17 ains for r 0.91	Apr 0.78 iving are 20.92 eriods in 20.18 est of dw 0.75	May 0.59 ea T1 (for 20.99 rest of 20.19 velling, 0.54	July 0.4 old old old old old old old old old old	un Jul 41 0.3 2 steps 3 to 7 1 21 Illing from Ta .2 20.2 1 (see Table 36 0.24	0.33 7 in Ta 21 able 9 20.3 9a) 0.2	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19	20.87 20.19 0.83	20.55	0.99 20.27 20.18		(87)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	Jan 0.99 interna 20.3 erature 20.17 ation fac 0.99 interna	Feb 0.97 Il tempera 20.47 during he 20.17 ctor for ga 0.97 Il tempera	Mar 0.92 ature in I 20.71 eating por 20.17 ature in t	Apr 0.78 iving are 20.92 eriods in 20.18 est of dw 0.75 the rest of	May 0.59 ea T1 (for 20.99 rest of 20.19 velling, 0.54	ollow 2 dwel 20 h2,m 0.3	un Jul 41 0.3 2 steps 3 to 7 1 21 Illing from Ta 2 20.2 1 (see Table 36 0.24	0.33 7 in Ta 21 able 9 20.3 9a) 0.23	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19 7 0.49 to 7 in Table	0.86 20.87 20.19 0.83 e 9c)	0.98 20.55 20.18	0.99 20.27 20.18		(87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	Jan 0.99 interna 20.3 erature 20.17 ation fac	Feb 0.97 Il tempera 20.47 during he 20.17 eter for ga 0.97	Mar 0.92 ature in I 20.71 eating por 20.17 ains for r 0.91	Apr 0.78 iving are 20.92 eriods in 20.18 est of dw 0.75	May 0.59 ea T1 (for 20.99 rest of 20.19 velling, 0.54 of dwell	July 0.4 old old old old old old old old old old	un Jul 41 0.3 2 steps 3 to 7 1 21 Illing from Ta 2 20.2 1 (see Table 36 0.24	0.33 7 in Ta 21 able 9 20.3 9a) 0.2	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19 7 0.49 to 7 in Table 2 20.19	0.86 20.87 20.19 0.83 e 9c) 20.06	0.98 20.55 20.18	0.99 20.27 20.18 0.99		(87) (88) (89) (90)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	Jan 0.99 interna 20.3 erature 20.17 ation fac 0.99 interna 19.24	Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Joseph Jo	Mar 0.92 ature in I 20.71 eating por 20.17 ature in t 19.83	Apr 0.78 iving are 20.92 eriods in 20.18 est of dw 0.75 he rest of	May 0.59 ea T1 (for 20.99 rest of 20.19 velling, 0.54 of dwell 20.18	0.4 collow 2: dwel 20 h2,m 0.3 ing T	un Jul 41 0.3 2 steps 3 to 7 1 21 Illing from Ta 2 20.2 1 (see Table 36 0.24 22 (follow ste 2 20.2	0.33 7 in Ta 21 able 9 20.3 9a) 0.23 eps 3 20.3	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19 7 0.49 to 7 in Table 2 20.19	0.86 20.87 20.19 0.83 e 9c) 20.06	0.98 20.55 20.18 0.97	0.99 20.27 20.18 0.99	0.42	(87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	Jan 0.99 interna 20.3 erature 20.17 ation fac 0.99 interna 19.24	Jetor for gas 19.5 ltempera	Mar 0.92 ature in I 20.71 eating por 20.17 ature in t 19.83 ature (for	Apr 0.78 iving are 20.92 eriods in 20.18 est of dw 0.75 the rest of 20.1	May 0.59 ea T1 (for 20.99 rest of 20.19 velling, 0.54 of dwell 20.18	dwell 20 h2,m 0.3 ling T 20	un Jul 41 0.3 steps 3 to 7 1 21 Illing from Ta .2 20.2 n (see Table 36 0.24 2 (follow ste .2 20.2	0.33 7 in Ta 21 able 9 20.3 9a) 0.25 eps 3 20.3	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19 7 0.49 to 7 in Table 2 20.19 f -fLA) × T2	0.86 20.87 20.19 0.83 e 9c) 20.06 LA = Liv	0.98 20.55 20.18 0.97 19.62 ring area ÷ (4	0.99 20.27 20.18 0.99 19.21	0.42	(87) (88) (89) (90) (91)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	Jan 0.99 interna 20.3 erature 20.17 ation fac 0.99 interna 19.24 interna 19.68	Feb 0.97 I tempera 20.47 during he 20.17 ctor for ga 0.97 I tempera 19.5	Mar 0.92 ature in I 20.71 eating por 20.17 ature in t 19.83 ature (for 20.2	Apr 0.78 iving are 20.92 eriods in 20.18 est of dw 0.75 the rest of 20.1	May 0.59 ea T1 (for 20.99 rest of 20.19 velling, 0.54 of dwell 20.18 ole dwell 20.51	Ju 0.4 0.4	un Jul 41 0.3 steps 3 to 7 1 21 Illing from Ta .2 20.2 n (see Table 36 0.24 2 (follow ste .2 20.2 a = fLA × T1 53 20.53	0.33 7 in Ta 21 able 9 20.2 9a) 0.2 eps 3 20.2 + (1 - 20.5	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19 7 0.49 to 7 in Table 2 20.19 f -fLA) × T2 3 20.52	0.86 20.87 20.19 0.83 e 9c) 20.06 LA = Liv	0.98 20.55 20.18 0.97	0.99 20.27 20.18 0.99	0.42	(87) (88) (89) (90)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply	Jan 0.99 interna 20.3 erature 20.17 ation fac 0.99 interna 19.24 interna 19.68 adjustr	Feb 0.97 I tempera 20.47 during he 20.17 ctor for ga 0.97 I tempera 19.5 I tempera 19.9 ment to th	Mar 0.92 ature in I 20.71 eating por 20.17 ature in t 19.83 ature (for 20.2 the mean	Apr 0.78 iving are 20.92 eriods in 20.18 est of dw 0.75 the rest of 20.1 r the who 20.44 internal	May 0.59 ea T1 (for 20.99 rest of 20.19 velling, 0.54 of dwell 20.18 ole dwe 20.51 temper	dwell 20 h2,m 0.3 ing T 20 lling) 20.	un Jul 41 0.3 2 steps 3 to 7 1 21 Illing from Ta 2 20.2 1 (see Table 0.24 2 (follow ste 2 20.2 1 = fLA × T1 53 20.53 2 from Table	0.33 7 in Ta 21 able 9 20.2 9a) 0.25 eps 3 20.2 + (1 - 20.5	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19 7 0.49 to 7 in Table 2 20.19 f -fLA) × T2 3 20.52 where approximates a significant content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of	20.87 20.19 0.83 e 9c) 20.06 LA = Liv	0.98 20.55 20.18 0.97 19.62 ring area ÷ (4) 20.01	0.99 20.27 20.18 0.99 19.21 19.65	0.42	(87) (88) (89) (90) (91) (92)
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(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spi Set T	Jan 0.99 interna 20.3 erature 20.17 ation fac 0.99 interna 19.24 interna 19.68 adjustr 19.68 ace head i to the	Feb 0.97 I tempera 20.47 during he 20.17 ctor for ga 0.97 I tempera 19.5 I tempera 19.9 ment to th 19.9 ting requ	Mar 0.92 ature in I 20.71 eating por 20.17 ains for r 0.91 ature in t 19.83 ature (for 20.2 de mean 20.2 derment ernal ten	Apr 0.78 iving are 20.92 eriods in 20.18 est of dw 0.75 the rest of 20.1 r the who 20.44 internal 20.44	May 0.59 ea T1 (for 20.99 rest of 20.19 velling, 0.54 of dwell 20.18 ole dwe 20.51 temper 20.51	Ju 0.4 0.4	un Jul 41 0.3 2 steps 3 to 7 1 21 Illing from Ta 2 20.2 1 (see Table 0.24 2 (follow ste 2 20.2 1 = fLA × T1 53 20.53 2 from Table	0.33 7 in Ta 21 able 9 20.2 9a) 0.25 eps 3 20.2 + (1 - 20.5	3 0.55 able 9c) 20.99 , Th2 (°C) 2 20.19 7 0.49 to 7 in Table 2 20.19 f -fLA) × T2 3 20.52 where approximates a second of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control	20.87 20.19 0.83 e 9c) 20.06 LA = Liv	0.98 20.55 20.18 0.97 19.62 ring area ÷ (4) 20.01	0.99 20.27 20.18 0.99 19.21 19.65		(87) (88) (89) (90) (91) (92)
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Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 393.09 450.99 493.11 474.74 381.74 255.57 169.63 177.68 276.87 380.81 382.89 373.57		(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		
(97)m= 693.04 673.79 613.08 508.03 386.71 255.91 169.66 177.74 279.05 429.93 570.2 686.93		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m		
(98)m= 223.16 149.72 89.25 23.97 3.7 0 0 0 36.54 134.86 233.13	004.05	(98)
Total per year (kWh/year) = Sum(98) _{15,912} = Space heating requirement in kWh/m²/year	894.35 17.89	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	e latter	_
Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.25	(306)
Spa <mark>ce he</mark> ating	kWh/year	_
Annual space heating requirement	894.35	╛
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1117.93	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating		_
Annual water heating requirement	1800.52	
If DHW from community scheme: Water heat from Community heat pump (64) x (303a) x (305) x (306) =	2250.65	(310a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] =	33.69	(313)
Cooling System Energy Efficiency Ratio	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	130.23	(330a)
warm air heating system fans	0	(330b)
pump for solar water heating	0	(330g)
Total electricity for the above, kWh/year $=(330a) + (330b) + (330g) =$	130.23	(331)
Energy for lighting (calculated in Appendix L)	231.81	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-329.34] (333)
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Electricity generated by wind turbine (Appendix M) (negative quantity) (334)12b. CO2 Emissions – Community heating scheme Energy **Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) 319 (367a) CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times$ 548.05 (367)0.52 Electrical energy for heat distribution (372)[(313) x]0.52 17.48 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)565.54 CO2 associated with space heating (secondary) (309) x(374)0 0 CO2 associated with water from immersion heater or instantaneous heater (312) x (375)0.52 0 Total CO2 associated with space and water heating (373) + (374) + (375) =565.54 (376)CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 67.59 CO2 associated with electricity for lighting (332))) x (379)0.52 120.31 Energy saving/generation technologies (333) to (334) as applicable Item 1 x = 0.01 =(380) 0.52 -170.93 sum of (376)...(382) = Total CO2, kg/year (383)582.51 $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)11.65 El rating (section 14) (385)91.78

		L	Jser D	etails:						
Assessor Name:			;	Stroma	a Num	ber:				
Software Name:	Stroma FSAP 201	12		Softwa				Versio	n: 1.0.4.26	
		Pro	perty A	Address:	A25_B	e Green				
Address :	The Charlie Ratchfo	ord Centre,	, Belmo	ont Stree	et, LONE	OON, NV	V1 8HF			
1. Overall dwelling dime	nsions:									
0 10			Area			Av. He		, ,	Volume(m³)	_
Ground floor				50	(1a) x	2	2.8	(2a) =	140	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)		50	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	140	(5)
2. Ventilation rate:										
		econdary neating	(other		total			m³ per hou	r
Number of chimneys	0 +	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	j = <u>F</u>	0	x 2	20 =	0	(6b)
Number of intermittent far	ns					2	x :	10 =	20	(7a)
Number of passive vents					Ī	0	x .	10 =	0	(7b)
Number of flueless gas fin	res				Ī	0	X 4	40 =	0	(7c)
								A: l-		
					_		<u> </u>	Air cn	anges per ho	our —
Infiltration due to chimney					Ļ	20		÷ (5) =	0.14	(8)
If a pressurisation test has be Number of storeys in th		ea, proceea to	0 (17), 0	inerwise c	ontinue in	om (9) to (16)	1	0	(9)
Additional infiltration	ie aweiling (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber	frame or 0.	.35 for	masonr	y constr	uction	,	•	0	(11)
	esent, use the value corres	sponding to th	ne greate	er wall area	a (after			!		
deducting areas of opening If suspended wooden fl	• /- •	lad) or 0.1	(soalo	d) also	ontor O			ı		7(12)
If no draught lobby, ent	,	ieu) oi o. i	(Seale	u), eise	enter 0				0	(12)
Percentage of windows	•	tripped							0	(14)
Window infiltration	and doors araugin s	пррос	(0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			((8) + (10) -	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cub	oic metres	per ho	ur per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ty value, then (18) = [(1	7) ÷ 20]+(8),	otherwis	se (18) = (16)				0.39	(18)
Air permeability value applies	s if a pressurisation test ha	s been done d	or a deg	ree air per	meability	is being us	sed			
Number of sides sheltere	d			(20) 4 [0 07E v (4	0\1			2	(19)
Shelter factor				(20) = 1 - [9)] =			0.85	(20)
Infiltration rate incorporati	_	_1	((21) = (18)	X (20) =				0.33	(21)
Infiltration rate modified for Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		1 5211		, .wg	<u> </u>		1	1 200	I	
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Footon (COn)	2) 4						•		•	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.95	0.92	1	1.08	1.12	1.18		
,	1				•				I	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39	1	
Calculate effec	tive air	change i	rate for t	he appli	cable ca	se	l	1			!	<u></u>	
If mechanica												0	(23a
If exhaust air he) = (23a)			0	(23b
If balanced with	heat reco	very: effic	ency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(230
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a
b) If balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		,	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b
c) If whole he if (22b)m				-	-				.5 × (23t	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural v				•					0.5]			•	
(24d)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58]	(24d
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	· (25)		•	•	-	
(25)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
3. Heat losses	and he	at loss i	naram e t	or.									_
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value		A X k kJ/K
Doors Type 1					2.5	x	1.2	= [3	$\stackrel{\prime}{\Box}$			(26)
Doors Type 2					2.5	X	1,2		3	Ħ			(26)
Windows Type	1				0.78	X 1	/[1/(1.4)+	0.041 =	1.03	Ħ			(27)
Windows Type					1.56		/[1/(1.4)+		2.07	4			(27)
Windows Type					1.14	_	/[1/(1.4)+	L		=			(27)
Windows Type Windows Type						=	/[1/(1.4)+	Ļ	1.51	\dashv			
Windows Type					2.46	_	/[1/(1.4)+	L	3.26	=			(27)
• •					1.56	=			2.07	ᆗ ,			(27)
Walls Tatalanaan (a)	67.7		12.5		55.26	=	0.18	= [9.95				(29)
Total area of el					67.76		. formando d	1//////////////////////////////////////				- 22	(31)
* for windows and ** include the area						atea using	i tormula 1	/[(1/U-vaiu	ie)+0.04] a	as given in	paragrapi	7 3.2	
Fabric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				25.8	9 (33)
Heat capacity (Cm = S(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	ter (TMF	o = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used instea				construct	ion are not	t known pr	ecisely the	; indicative	values of	TMP in Ta	able 1f		
Thermal bridge	s : S (L	x Y) cal	culated ι	using Ap	pendix ł	<						3.38	(36)
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	· (36) =			29.2	7 (37)
Ventilation hea	ıt loss ca	alculated	l monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 27.29	27.12	26.97	26.22	26.08	25.42	25.42	25.3	25.68	26.08	26.36	26.66	1	(38)
Heat transfer c	oefficier:	nt. W/K			•		•	(39)m	= (37) + (37)	38)m	•	-	
		,						(-)	· / (•			
(39)m= 56.56	56.4	56.24	55.49	55.35	54.7	54.7	54.58	54.95	55.35	55.64	55.93		

Ugot logo poros	motor (l	JI D) \\\	/m21/					(40)m	(20)m .	(4)			
Heat loss parar	1.13	1.12	1.11	1.11	1.09	1.09	1.09	1.1	= (39)m ÷	1.11	1.12		
(40)111= 1.13	1.13	1.12	1.11	1.11	1.09	1.09	1.09			<u> </u>		1.11	(40)
Number of day	s in mo	nth (Tabl	le 1a)					,	Average =	: Sum(40) _{1.}	12 / 12=	1.11	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
L1						!	Į.		<u> </u>	•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	pancy, l	N								1.	69		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)			
Annual average	e hot wa										.34		(43)
Reduce the annual	-				-	-	to achieve	a water us	se target o	of ^t		l	
not more that 125					lot and co	1					1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	litres pei			Va,m = ta	ctor trom	i able 1c x	(43) 1					l	
(44)m= 81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77		_
Energy content of	hot water	used cal	culated m	onthly - 1	100 v Vd r	n v nm v F	Tm / 2600			ım(44) ₁₁₂ =		892.08	(44)
									,				
(45)m= 121.27	106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44		(45)
If instantaneous wa	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =		1169.66	(45)
(46)m= 18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62		(46)
Water storage		10.12	11.01	10.70	11.00	0.00	12.0	12.10	11.00	10.22	17.02		(- /
Storage volume	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community he	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufactu	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost from		_	-				(48) x (49)) =		0.	75		(50)
b) If manufactu			-									· I	
Hot water stora	-			e 2 (KW	n/litre/da	ay)					0		(51)
If community he Volume factor f	•		on 4.3								0		(52)
Temperature fa			2h							_	0		(52)
Energy lost from				oor			(47) v (51)) x (52) x (53) –				, ,
Enter (50) or (_	, KVVII/yt	Jai			(47) X (01)) X (02) X (00) =	-	0 75		(54) (55)
Water storage	, ,	,	or each	month			((56)m = (55) × (41)ı	m	<u> </u>	70		()
					00.50		·		ı	1 00 50	00.00		(EC)
(56)m= 23.33 If cylinder contains	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)ı	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 (H11) is fro	23.33 m Append	ix H	(56)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	noual) fro	m Table	. 3							0		(58)
Primary circuit	•	•			59)m = ((58) ± 36	35 × (41)	m			-		(/
(modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
` '											'-		. ,

Combi loss	salaulatad	for oach	, month	(61)m –	(60) · '	265 v (41	/m							
(61)m= 0	0	0	0	01)111 =	00) + \	000 x (41)III 0		0	0	0	0	1	(61)
								!] · (59)m + (61)m	(0.)
(62)m= 167.8		156.04	140.51	138.15	124.1	119.81	130.	_	130.11	145.67	153.24	164.04]	(62)
Solar DHW inpo		<u> </u>	1				ļ						J	(-)
(add addition											ion to wat	or riodairig)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from	water hea	ter	•			_ I	!				·		J	
(64)m= 167.8	_	156.04	140.51	138.15	124.1	119.81	130.	.61	130.11	145.67	153.24	164.04]	
		!		l .	<u> </u>	- I		Outp	ut from wa	ater heate	er (annual)	12	1718.27	(64)
Heat gains f	om water	heating	, kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	า + (6	1)m	1] + 0.8 >	c [(46)m	+ (57)m	+ (59)m		_
(65)m= 77.6		73.67	67.8	67.72	62.34	61.62	65.2	_	64.34	70.22	72.03	76.33]	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwelli	ing (or hot w	ater is f	rom com	munity h	neating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):														
Metabolic ga														
Jar		Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(66)m= 84.5°	84.51	84.51	84.51	84.51	84.51	84.51	84.5	51	84.51	84.51	84.51	84.51		(66)
Ligh <mark>ting g</mark> air	s (calcula	ted in A	ppendix	L, equ <mark>a</mark> t	ion L9	or L9a), a	ilso s	ee T	Table 5					
(67)m= 13.24	11.76	9.56	7.24	5.41	4.57	4.94	6.4	2	8.61	10.94	12.76	13.61		(67)
App <mark>liance</mark> s (gains (ca <mark>lc</mark>	ulated i	n Append	dix L, eq	uation	_13 or L1	3 a), a	also	see Ta	ble 5				
(68)m= 147.2	3 148.76	144.91	136.72	126.37	116.64	110.15	108.	.62	112.47	120.67	131.01	140.74		(68)
Cooking gain	ns (calcula	ited in A	ppendix	L, equat	ion L1	or L15a), also	o se	e Table	5				
(69)m= 31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.4	45	31.45	31.45	31.45	31.45		(69)
Pumps and	ans gains	(Table	5a)										-	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							-		
(71)m= -67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67	.6	-67.6	-67.6	-67.6	-67.6		(71)
Water heating	ng gains (T	able 5)											_	
(72)m= 104.3	3 102.58	99.01	94.17	91.02	86.59	82.82	87.6	65	89.36	94.38	100.05	102.59		(72)
Total intern	al gains =	:			(6	6)m + (67)n	n + (68	8)m +	- (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 316.1	2 314.45	304.84	289.47	274.15	259.15	249.26	254.	.04	261.8	277.33	295.17	308.28		(73)
6. Solar ga	ns:													
Solar gains ar		•					ations t	to co		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		T:	g_ able 6b	т	FF able 6c		Gains (W)	
Foot					_		1 r						. ,	7,,
East 0.9		X			X	19.64] X [0.63	╣ ^ϫ ╞	0.7	=	9.36	 (76)
East 0.9		X			X	19.64	X [0.63	_ ×	0.7	=	14.77	 (76)
East 0.9		X			x	38.42]		0.63	×	0.7	=	18.32	 (76)
East 0.9		Х	2.4	16	x	38.42]		0.63	_ ×	0.7	=	28.88	(76)
	0.77	X	1.5		X	63.27	X		0.63	X	0.7	=	30.17	(76)

	_												_
East	0.9x	0.77	X	2.46	X	63.27	X	0.63	X	0.7	=	47.57	(76)
East	0.9x	0.77	x	1.56	x	92.28	X	0.63	X	0.7	=	44	(76)
East	0.9x	0.77	X	2.46	X	92.28	X	0.63	X	0.7	=	69.38	(76)
East	0.9x	0.77	X	1.56	x	113.09	x	0.63	X	0.7	=	53.92	(76)
East	0.9x	0.77	X	2.46	x	113.09	X	0.63	X	0.7	=	85.02	(76)
East	0.9x	0.77	X	1.56	X	115.77	X	0.63	X	0.7	=	55.19	(76)
East	0.9x	0.77	X	2.46	x	115.77	X	0.63	X	0.7	=	87.04	(76)
East	0.9x	0.77	x	1.56	x	110.22	x	0.63	X	0.7	=	52.55	(76)
East	0.9x	0.77	x	2.46	X	110.22	X	0.63	X	0.7	=	82.86	(76)
East	0.9x	0.77	X	1.56	x	94.68	x	0.63	X	0.7	=	45.14	(76)
East	0.9x	0.77	x	2.46	x	94.68	x	0.63	X	0.7	=	71.18	(76)
East	0.9x	0.77	x	1.56	x	73.59	x	0.63	X	0.7	=	35.08	(76)
East	0.9x	0.77	x	2.46	x	73.59	x	0.63	x	0.7	=	55.32	(76)
East	0.9x	0.77	x	1.56	x	45.59	x	0.63	x	0.7	=	21.73	(76)
East	0.9x	0.77	x	2.46	x	45.59	x	0.63	x	0.7	=	34.27	(76)
East	0.9x	0.77	x	1.56	x	24.49	x	0.63	X	0.7	=	11.68	(76)
East	0.9x	0.77	x	2.46	x	24.49	x	0.63	x	0.7	=	18.41	(76)
East	0.9x	0.77	x	1.56	X	16.15	Х	0.63	X	0.7	=	7.7	(76)
East	0.9x	0.77] x	2.46	x	16.15	x	0.63	x	0.7	=	12.14	(76)
South	0.9x	0.77] x	0.78	х	46.75	×	0.63	x	0.7	=	11.14	(78)
South	0.9x	0.77	x	0.78	x	76.57	x	0.63	x	0.7	=	18.25	(78)
South	0.9x	0.77	x	0.78	х	97.53	Х	0.63	x	0.7	=	23.25	(78)
South	0.9x	0.77	x	0.78	x	110.23	X	0.63	x	0.7	=	26.28	(78)
South	0.9x	0.77	x	0.78	х	114.87	x	0.63	x	0.7	=	27.38	(78)
South	0.9x	0.77	x	0.78	x	110.55	x	0.63	X	0.7	=	26.35	(78)
South	0.9x	0.77	x	0.78	x	108.01	x	0.63	X	0.7	=	25.75	(78)
South	0.9x	0.77	x	0.78	x	104.89	x	0.63	X	0.7	=	25	(78)
South	0.9x	0.77	x	0.78	x	101.89	x	0.63	X	0.7	=	24.29	(78)
South	0.9x	0.77	x	0.78	x	82.59	x	0.63	x	0.7	=	19.69	(78)
South	0.9x	0.77	x	0.78	x	55.42	x	0.63	x	0.7	=	13.21	(78)
South	0.9x	0.77	x	0.78	x	40.4	x	0.63	X	0.7	=	9.63	(78)
West	0.9x	0.77	x	1.14	x	19.64	X	0.63	X	0.7	=	6.84	(80)
West	0.9x	0.77	x	1.56	x	19.64	x	0.63	X	0.7	=	9.36	(80)
West	0.9x	0.77	x	1.14	x	38.42	X	0.63	X	0.7	=	13.39	(80)
West	0.9x	0.77	x	1.56	x	38.42	X	0.63	X	0.7	=	18.32	(80)
West	0.9x	0.77	x	1.14	x	63.27	x	0.63	x	0.7	=	22.04	(80)
West	0.9x	0.77	x	1.56	x	63.27	x	0.63	x	0.7] =	30.17	(80)
West	0.9x	0.77	x	1.14	x	92.28	х	0.63	x	0.7	=	32.15	(80)
West	0.9x	0.77	x	1.56	x	92.28	x	0.63	x	0.7] =	44	(80)
West	0.9x	0.77	x	1.14	x	113.09	x	0.63	x	0.7] =	39.4	(80)
West	0.9x	0.77	x	1.56	x	113.09	x	0.63	x	0.7] =	53.92	(80)
	_		•		•		•				•		-

West	0.9x	0.77	X	1.1	14	X	1	15.77	x		0.63	x	0.7		=	4	0.33	(80)
West	0.9x	0.77	x	1.5	56	X	1	15.77	x		0.63	x	0.7		=	5	5.19	(80)
West	0.9x	0.77	x	1.1	14	X	1	10.22	x		0.63	x	0.7		=	;	38.4	(80)
West	0.9x	0.77	x	1.5	56	X	1	10.22	x		0.63	×	0.7		=	5	2.55	(80)
West	0.9x	0.77	X	1.1	14	X	9	4.68	X		0.63	x	0.7		=	3	2.98	(80)
West	0.9x	0.77	x	1.5	56	X	9	4.68	x		0.63	x	0.7		=	4	5.14	(80)
West	0.9x	0.77	x	1.1	14	X	7	'3.59	x		0.63	×	0.7		=	2	5.64	(80)
West	0.9x	0.77	x	1.5	56	X	7	3.59	x		0.63	x	0.7		=	3	5.08	(80)
West	0.9x	0.77	X	1.1	14	X	4	5.59	X		0.63	x	0.7		=	1	5.88	(80)
West	0.9x	0.77	X	1.5	56	X	4	5.59	x		0.63	x	0.7		=	2	1.73	(80)
West	0.9x	0.77	X	1.1	14	X	2	4.49	x		0.63	×	0.7		=	8	3.53	(80)
West	0.9x	0.77	X	1.5	56	X	2	4.49	X		0.63	×	0.7		=	1	1.68	(80)
West	0.9x	0.77	X	1.1	14	X	1	6.15	X		0.63	×	0.7		=	Į.	5.63	(80)
West	0.9x	0.77	X	1.5	56	X	1	6.15	X		0.63	x	0.7		=		7.7	(80)
									_									
Solar ga	ains in	watts, ca	lculated	for eac	h month	1			(83)m	ı = Su	m(74)m .	(82)m						
(83)m=	51.48	97.16	153.2	215.79	259.64	26	64.11	252.11	219	.44	175.42	113.3	1 63.5	42	2.8			(83)
Total ga	ins – ir	nternal a	nd solar	(84)m =	= (73)m	+ (8	83)m	, watts						,				
(84)m=	367.6	411.61	458.03	505.27	533.79	52	23.26	501.36	473	.48	437.22	390.6	5 358.68	35′	1.08			(84)
7. Mea	n inter	nal temp	erature	(heating	seasor				A									
Tempe	rature	during he	eating p	eriods ir	n the livi	ing	area 1	from Tak	ble 9	Th1	(°C)						21	(85)
											,							
Utilisat	<mark>io</mark> n fac	tor for ga	ains for l	living are	ea, h1,n	n (s	ee Ta	ble 9a)										
Util <mark>isat</mark>	<mark>io</mark> n fac Jan	tor for ga	ains for Mar	living are	ea, h1,n May		ee Ta Jun	ble 9a) Jul	A	ug	Sep	Oct	Nov		Эес			
Utilisat (86)m=		Ī				Ĺ			A 0.5	ug		Oct	Nov 0.99	+-)ec 1			(86)
(86)m=	Jan 0.99	Feb 0.99	Mar 0.98	Apr 0.93	May 0.82		Jun 0.64	Jul 0.47	0.5	ug 52	Sep 0.77	_	_	+-				(86)
(86)m=	Jan 0.99	Feb	Mar 0.98	Apr 0.93	May 0.82	ollo	Jun 0.64	Jul 0.47	0.5	ug 52 able	Sep 0.77	_	0.99					(86)
(86)m= Mean i	Jan 0.99 nterna 19.91	0.99 l tempera 20.06	0.98 ature in 20.31	Apr 0.93 living are 20.62	0.82 ea T1 (f	follo 2	Jun 0.64 ow ste 20.97	Jul 0.47 ps 3 to 7 20.99	0.5 7 in T 20.	ug 52 able	Sep 0.77 9c) 20.92	0.95	0.99		1			` ,
(86)m= Mean i (87)m= Tempe	Jan 0.99 nterna 19.91	Feb 0.99	0.98 ature in 20.31	Apr 0.93 living are 20.62	0.82 ea T1 (f	follo 2	Jun 0.64 ow ste 20.97	Jul 0.47 ps 3 to 7 20.99	0.5 7 in T 20.	ug 52 able 99 9, Th	Sep 0.77 9c) 20.92	0.95	0.99	19	1			` ,
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(86)m= Mean i (87)m= Tempe (88)m= Utilisat	Jan 0.99 nternal 19.91 erature 19.98 ion fac	Feb 0.99 tempera 20.06 during he 19.98 tor for ga	Mar 0.98 ature in 20.31 eating p 19.98	Apr 0.93 living are 20.62 periods in 19.99	May 0.82 ea T1 (f 20.86 rest of 20 welling,	follo 2 dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01	0.57 in T 20. able 9 20.	ug 52 able 99 7, Th	Sep 0.77 9c) 20.92 2 (°C) 20	20.61	0.99 20.21 19.99	19	.89			(87)
(86)m=	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99	Mar 0.98 ature in 20.31 eating p 19.98 ains for 1 0.97	Apr 0.93 living ard 20.62 periods in 19.99 rest of d 0.91	May 0.82 ea T1 (f 20.86 rest of 20 welling, 0.77	follo 2 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37	0.57 in T 20. able 9 20. 920. 920.	ug 52 52 52 54 54 54 54 54	Sep 0.77 9c) 20.92 2 (°C) 20	20.61 20 0.93	0.99	19	.89			(87)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i	Jan 0.99 nternal 19.91 rature 19.98 ion fac 0.99 nternal	Feb 0.99 I tempera 20.06 during ho 19.98 tor for ga 0.99 I tempera	Mar 0.98 ature in 20.31 eating p 19.98 ains for 0.97 ature in	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell	dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste	0.57 in T 20. able 9 20. 9 9 9 9 0.4	ug 52 able 99 5, Th 01 5 to 7	Sep 0.77 20.92 2 (°C) 20 0.69 in Tabl	20.61 20 0.93 e 9c)	0.99 20.21 19.99 0.99	19	.89			(87) (88) (89)
(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99	Mar 0.98 ature in 20.31 eating p 19.98 ains for 1 0.97	Apr 0.93 living ard 20.62 periods in 19.99 rest of d 0.91	May 0.82 ea T1 (f 20.86 rest of 20 welling, 0.77	dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37	0.57 in T 20. able 9 20. 920. 920.	ug 52 able 99 5, Th 01 5 to 7	Sep 0.77 9c) 20.92 2 (°C) 20 0.69 in Tabl 19.94	20.61 20 0.93 e 9c) 19.56	0.99 20.21 19.99 0.99	19	.89			(87) (88) (89) (90)
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(86)m= Mean i (87)m= Tempe (88)m= Utilisat (89)m= Mean i (90)m=	Jan 0.99 nterna 19.91 rature 19.98 ion fac 0.99 nterna 18.54	Feb 0.99 I tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75	Mar 0.98 ature in 20.31 eating p 19.98 ains for 1 0.97 ature in 19.11	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest 19.56	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell 19.86	f dw 2 h2,	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55 T2 (fo	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste	0.57 in T 20. able 9 20. e 9a) 0.4	ug 52 able 99 52, Th 01 54 to 7 0 54 64 64 64 64 64 64 64 64 64 64 64 64 64	Sep 0.77 20.92 2 (°C) 20 0.69 in Tabl 19.94	20.61 20 0.93 e 9c) 19.56	0.99 20.21 19.99 0.99	19 19 0.	.89	(0.42	(87) (88) (89) (90)
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Mean i (86)m= Mean i (87)m= Utilisat (89)m= Mean i (90)m= Mean i (92)m= Apply a (93)m= Set Ti t the utili	Jan 0.99 nternal 19.91 erature 19.98 ion fac 0.99 nternal 18.54 nternal 19.11 adjustn 19.11 ce hea to the r isation Jan	tempera 20.06 during he 19.98 tor for ga 0.99 I tempera 18.75 I tempera 19.29 hent to th 19.29 ting requences	Mar 0.98 ature in 20.31 eating p 19.98 ains for 0.97 ature in 19.11 ature (for 19.61 irement ernal ter r gains Mar	Apr 0.93 living are 20.62 periods in 19.99 rest of d 0.91 the rest 19.56 or the wh 20 n interna 20 mperaturusing Tal	May 0.82 ea T1 (f 20.86 n rest of 20 welling, 0.77 of dwell 19.86 aole dwe 20.27 I tempe 20.27 re obtainable 9a	follo 2 follo 2 h2, h2, follo 1 raturaturaturaturaturaturaturaturaturatu	Jun 0.64 ow ste 20.97 velling 20.01 ,m (se 0.55 T2 (fd 9.99 g) = fl 20.4 ure fro 20.4	Jul 0.47 ps 3 to 7 20.99 from Ta 20.01 ee Table 0.37 collow ste 20 LA × T1 20.42 m Table 20.42 ep 11 of	0.57 in T 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 20. able 9 2	ug 52 52 53 54 55 55 55 55 55 55	Sep 0.77 20.92 2 (°C) 20 0.69 in Tabl 19.94 f A) × T2 20.35 re appro 20.35 , so tha	0.95 20.61 20 0.93 e 9c) 19.56 LA = Livitation 20 ppriate 20 t Ti,m:	0.99 20.21 19.99 0.99 18.98 ving area ÷ 19.49 =(76)m ar	19 19 0. 18 18 14 19 19 19 19 19	.89 .99 .51		0.42	(87) (88) (89) (90) (91)

Useful gains, hmGm , W	/ – (04)m :	(84)m									
	41.96 459	` '	307.55	207.49	217.05	316.53	364.09	352.67	348.67		(95)
Monthly average externa				207.49	217.03	310.55	304.03	332.07	340.07		(00)
, , , , , , , , , , , , , , , , , , , 	6.5 8.		14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean	internal te	mperature,	Lm , W :	=[(39)m	x [(93)m	– (96)m]				
	37.19 615		317.06	208.74	219.15	343.49	520.32	689.5	832.35		(97)
Space heating requirement	ent for ea	ch month, k	:Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 351.95 273.27 2°	19.65 112	.97 41.25	0	0	0	0	116.24	242.52	359.86		
<u> </u>		•			Tota	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	1717.71	(98)
Space heating requirement	ent in kWł	n/m²/year								34.35	(99)
9a. Energy requirements	– Individu	al heating s	systems i	ncluding	micro-C	CHP)					
Space heating:									_		_
Fraction of space heat fr	om secon	dary/supple	ementary	system						0	(201)
Fraction of space heat fr	om main :	system(s)			(202) = 1	- (201) =				1	(202)
Fraction of total heating	from main	system 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space	heating s	ystem 1								93.5	(206)
Efficiency of secondary/s	suppl <mark>eme</mark>	ntary heatin	g systen	n, %						0	(208)
Jan Feb	Mar A	pr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirem	ent (calcu	ated above)								
351.95 273.27 2°	19.65 112	.97 41.25	0	0	0	0	116.24	242.52	359.86		
(211) m = {[(98)m x (204)]	} x 100 ÷	(206)	•								(211)
	34.92 120		0	0	0	0	124.32	259.38	384.88		
					Tota	l (kWh/yea	ar) =Sum(2	211),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		1837.12	(211)
Space heating fuel (seco	ondary), k'	Wh/month									_
= {[(98)m x (201)] } x 100	÷ (208)										
(215)m = 0 0	0 0	0	0	0	0	0	0	0	0		_
					Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating											_
Output from water heater			T	T	T						
	56.04 140	.51 138.15	124.1	119.81	130.61	130.11	145.67	153.24	164.04		٦
Efficiency of water heater			T	l	l					79.8	(216)
` '	5.73 84.	24 82.03	79.8	79.8	79.8	79.8	84.22	86.03	86.85		(217)
Fuel for water heating, kV $(219)m = (64)m \times 100 \div$											
` '	32.02 166	5.8 168.42	155.51	150.13	163.67	163.04	172.97	178.12	188.87		
	•	•	•	•	Tota	I = Sum(2	19a) ₁₁₂ =	•		2054.47	(219)
Annual totals							k'	Wh/year		kWh/year	_
Space heating fuel used,	main syst	em 1								1837.12	
Water heating fuel used									Ī	2054.47	
Electricity for pumps, fans	and elec	tric keep-ho	ot						•		_
central heating pump:									30		(230c)

boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a))(230g) =		75	(231)
Electricity for lighting				233.78	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	396.82	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	443.76	(264)
Space and water heating	(261) + (262) + (263) + (264) =			840.58	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)

0.519

sum of (265)...(271) =

TER = 29.26 (273)

(232) x

Electricity for lighting

Total CO2, kg/year

(268)

(272)

121.33

1000.84

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Versio	on: 1.0.4.26	
		Property	Address:	B57_B	e Green				
Address :	The Charlie Ratchford Cen	tre, Belm	ont Stree	t, LONI	OON, NV	V1 8HF			
1. Overall dwelling dime	nsions:								
0			a(m²)		Av. He		ا	Volume(m³	_
Ground floor			70.1	(1a) x	2	2.8	(2a) =	196.28	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	70.1	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	196.28	(5)
2. Ventilation rate:									
	main seconda heating heating	ıry	other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	= [0	x 2	20 =	0	(6b)
Number of intermittent far	ns				0	x .	10 =	0	(7a)
Number of passive vents				Ī	0	x .	10 =	0	(7b)
Number of flueless gas fin	res			Ī	0	X 4	40 =	0	(7c)
				_			Air ob	anges ner he	
		_		_			Air cn	nanges per ho	_
	ys, flues and fans = (6a)+(6b)+ een carried out or is intended, proce			ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		ed 10 (17), (ourierwise c	onunue ii	om (9) to (10)		0	(9)
Additional infiltration	is an amount of					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame of	or 0.35 fo	r masonr	constr	uction			0	(11)
	esent, use the value corresponding	to the great	ter wall area	a (after			!		_
deducting areas of opening	_{lgs);} if equal user 0.35 loor, enter 0.2 (unsealed) or () 1 (soale	ad) also (ontor O					7(12)
If no draught lobby, ent	,	o.i (Seale	ou), eise (SIILEI U				0	(12)
• • • • • • • • • • • • • • • • • • • •	and doors draught stripped							0	(14)
Window infiltration	and doors arangmentprod		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) +	- (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per ho	our per so	uare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] +$	(8), otherwi	ise (18) = (16)				0.15	(18)
	s if a pressurisation test has been do	one or a de	gree air per	meability	is being us	sed	'		_
Number of sides sheltere	d		(20) – 1 [0.075 v (4	10)1			2	(19)
Shelter factor	in a chaltar factor		(20) = 1 - [19)] =			0.85	(20)
Infiltration rate incorporat	•		(21) = (18)	X (20) =				0.13	(21)
Infiltration rate modified for		1 1	1 4	Con	0-4	Nov	Daa		
l l	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		1 00	1 2 7 1		l 42	4.5	4.7	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m =	2)m ÷ 4							_	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	te (allowi	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effe		•	rate for t	пе арри	саріе са	ise						0.5	(23a)
If exhaust air h	eat pump	using App	endix N, (2	23b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced with	h heat rec	overy: effic	eiency in %	allowing t	or in-use f	actor (fron	n Table 4h) =				76.5	(23c)
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27]	(24a)
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	MV) (24b	m = (22)	2b)m + (23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•									
	1	× (23b), 1	· ` `	ŕ	ŕ	· ` `	ŕ	ŕ	· ` `	í –		1	(0.4-)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r		on or wh ien (24d)		•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and h	eat loss	paramet	er:							_	_	
ELEMENT	Gro	SS	Openir		Net Ar		U-val		ΑXU		k-valu		ΑΧk
	area	(m²)	n) ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²•	K	kJ/K
Doors					2.4	X	1.3		3.12				(26)
Windows Type					2.6		/[1/(1.3)+		3.21	H			(27)
Windows Type					2.4		/[1/(1.3)+		2.97	닡			(27)
Windows Type					2.6	=	/[1/(1.3)+		3.21	_			(27)
Windows Type					2.6		/[1/(1.3)+		3.21	_			(27)
Windows Type	e 5 				2.6	x1	/[1/(1.3)+	0.04] =	3.21	╛.			(27)
Walls Type1	22.9	96	23		-0.04	X	0.15	=	-0.01	<u> </u>		_	(29)
Walls Type2	8.1	2	0		8.12	X	0.14	=	1.15			_	(29)
Walls Type3	12.0	04	0		12.04	1 X	0.13	=	1.59				(29)
Total area of e	elements	s, m²			43.12	2							(31)
* for windows and ** include the are						lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	1 3.2	
Fabric heat los				із апа раг	uuons		(26)(30) + (32) =				31.31	(33)
Heat capacity		•	- /					((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass		,	⊃ = Cm -	÷ TFA) ir	n kJ/m²K			., ,	itive Value	, , ,	· -/	250	(35)
For design asses	-						ecisely the	e indicative	e values of	TMP in Ta	able 1f		(/
can be used inste													
Thermal bridg					-	K						2.16	(36)
if details of therma Total fabric he		are not kr	own (36) :	= 0.05 x (3	11)			(33) +	· (36) =			33.47	(37)
Ventilation hea		alculated	d monthl	V					= 0.33 × ((25)m x (5))	33.47	(07)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
			1	 ,	1	1	1	1	1	1		ı	

(38)m= 18.14	17.93	17.73	16.7	16.49	15.46	15.46	15.25	15.87	16.49	16.9	17.31	1	(38)
Heat transfer of	l		10.7	10.49	13.40	13.40	13.23		= (37) + (37)	l	17.51		(00)
(39)m= 51.61	51.4	51.19	50.16	49.95	48.92	48.92	48.72	49.33	49.95	50.37	50.78]	
Heat loss para	meter (F	H D) \\\/	m²k						Average = = (39)m ÷	Sum(39) ₁	12 /12=	50.11	(39)
(40)m= 0.74	0.73	0.73	0.72	0.71	0.7	0.7	0.69	0.7	0.71	0.72	0.72		
								,	Average =	Sum(40) ₁	12 /12=	0.71	(40)
Number of day	ys in moi	nth (Tab	le 1a)								•		_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ener	gy requi	rement:								kWh/ye	ear:	
Assumed occu	upancy. I	V								2	.25]	(42)
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.		.23		(12)
if TFA £ 13.	•				\ / al .a		(OF ~ NI)	. 20				1	(40)
Annual average Reduce the annual									se target o		7.6		(43)
not more that 125	litres per p	oerson per	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)				•		
(44)m= 96.36	92.86	89.36	85.85	82.35	78.84	78.84	82.35	85.85	89.36	92.86	96.36		
										m(44) ₁₁₂ =		1051.24	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600 •	kWh/mon	th (see Ta	bles 1b, 1	(c, 1d)		
(45)m= 142.9	124.98	128.97	112.44	107.89	93.1	86.27	99	100.18	116.75	127.44	138.39		_
If instantaneous v	vater heatii	na at point	of use (no	hot water	: storage).	enter () in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1378.34	(45)
	18.75	19.35	16.87	16.18	13.97	12.94	14.85	15.03	17.51	19.12	20.76		(46)
(46)m= 21.44 Water storage		19.35	10.07	10.16	13.97	12.94	14.65	15.03	17.51	19.12	20.76		(40)
Storage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
Water storage			(. /1.14/1	1.1- \						1	
a) If manufact				or is kno	wn (kvvr	ı/day):					.63		(48)
Temperature f							(40) (40)).6	1	(49)
Energy lost from b) If manufact		-	-		or is not		(48) x (49)	=		0.	.98		(50)
Hot water stor			•								0		(51)
If community h	neating s	ee sectio	on 4.3										
Volume factor											0		(52)
Temperature f											0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	-	0		(54)
Enter (50) or	, ,	•					((50) (FF) (44)		0.	.98		(55)
Water storage							((56)m = (, , ,		ı	1	1	/==·
(56)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32	liv L	(56)
If cylinder contain												1	
(57)m= 30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(57)

Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) \div 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m +$	(61)m
(62)m= 196.48 173.38 182.55 164.29 161.47 144.95 139.85 152.58 152.03 170.33 179.3 191.98	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 196.48 173.38 182.55 164.29 161.47 144.95 139.85 152.58 152.03 170.33 179.3 191.98	
Output from water heater (annual) 112 2009	.2 (64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]	
(65)m= 90.38 80.27 85.75 78.87 78.74 72.44 71.55 75.78 74.79 81.68 83.86 88.88	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 17.61 15.64 12.72 9.63 7.2 6.08 6.57 8.54 11.46 14.55 16.98 18.1	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 197.53 199.58 194.41 183.42 169.54 156.49 147.78 145.73 150.89 161.89 175.77 188.81	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24	(69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94	(71)
Water heating gains (Table 5)	
(72)m= 121.48 119.45 115.25 109.54 105.83 100.61 96.17 101.86 103.88 109.79 116.47 119.46	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 393.35 391.4 379.12 359.32 339.3 319.91 307.24 312.85 322.95 342.95 365.94 383.11	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6d m ² Table 6a Table 6b Table 6c (W)	
North 0.9x 0.77 x 2.6 x 10.63 x 0.53 x 0.7 = 14.2	2 (74)
North 0.9x 0.77 x 2.6 x 10.63 x 0.53 x 0.7 = 14.2	2 (74)

	_		7				,		ı				_
North	0.9x	0.77	X	2.6	X	10.63	X	0.53	X	0.7	=	14.22	(74)
North	0.9x	0.77	X	2.6	X	20.32	X	0.53	X	0.7	=	27.17	(74)
North	0.9x	0.77	X	2.6	X	20.32	X	0.53	X	0.7	=	27.17	(74)
North	0.9x	0.77	X	2.6	X	20.32	X	0.53	X	0.7	=	27.17	(74)
North	0.9x	0.77	X	2.6	X	34.53	X	0.53	X	0.7	=	46.16	(74)
North	0.9x	0.77	X	2.6	x	34.53	X	0.53	x	0.7	=	46.16	(74)
North	0.9x	0.77	X	2.6	X	34.53	X	0.53	x	0.7	=	46.16	(74)
North	0.9x	0.77	X	2.6	X	55.46	X	0.53	X	0.7	=	74.15	(74)
North	0.9x	0.77	X	2.6	X	55.46	X	0.53	X	0.7	=	74.15	(74)
North	0.9x	0.77	X	2.6	x	55.46	X	0.53	x	0.7	=	74.15	(74)
North	0.9x	0.77	x	2.6	x	74.72	x	0.53	x	0.7	=	99.89	(74)
North	0.9x	0.77	X	2.6	x	74.72	x	0.53	x	0.7	=	99.89	(74)
North	0.9x	0.77	x	2.6	x	74.72	x	0.53	x	0.7	=	99.89	(74)
North	0.9x	0.77	x	2.6	x	79.99	x	0.53	x	0.7	=	106.94	(74)
North	0.9x	0.77	x	2.6	x	79.99	x	0.53	x	0.7	=	106.94	(74)
North	0.9x	0.77	x	2.6	x	79.99	x	0.53	x	0.7	=	106.94	(74)
North	0.9x	0.77	x	2.6	x	74.68	x	0.53	x	0.7	=	99.84	(74)
North	0.9x	0.77	X	2.6	X	74.68	Х	0.53	X	0.7	=	99.84	(74)
North	0.9x	0.77] x	2.6	x	74.68] x	0.53	x	0.7	=	99.84	(74)
North	0.9x	0.77	x	2.6	х	59.25] x	0.53	x	0.7	=	79.21	(74)
North	0.9x	0.77	x	2.6	x	59.25	x	0.53	x	0.7	=	79.21	(74)
North	0.9x	0.77	x	2.6	x	59.25	Х	0.53	x	0.7	=	79.21	(74)
North	0.9x	0.77	x	2.6	x	41.52	x	0.53	x	0.7	=	55.5	(74)
North	0.9x	0.77	x	2.6	х	41.52	x	0.53	x	0.7	=	55.5	(74)
North	0.9x	0.77	x	2.6	x	41.52	x	0.53	x	0.7	=	55.5	(74)
North	0.9x	0.77	X	2.6	x	24.19	X	0.53	x	0.7	=	32.34	(74)
North	0.9x	0.77	x	2.6	x	24.19	x	0.53	x	0.7	=	32.34	(74)
North	0.9x	0.77	x	2.6	x	24.19	x	0.53	x	0.7	=	32.34	(74)
North	0.9x	0.77	x	2.6	x	13.12	x	0.53	x	0.7	=	17.54	(74)
North	0.9x	0.77	x	2.6	x	13.12	x	0.53	x	0.7	=	17.54	(74)
North	0.9x	0.77	x	2.6	x	13.12	x	0.53	x	0.7	=	17.54	(74)
North	0.9x	0.77	x	2.6	x	8.86	x	0.53	X	0.7	=	11.85	(74)
North	0.9x	0.77	x	2.6	x	8.86	х	0.53	x	0.7	=	11.85	(74)
North	0.9x	0.77	x	2.6	x	8.86	x	0.53	x	0.7	=	11.85	(74)
Northeas	st _{0.9x}	0.3	x	2.4	x	11.28	x	0.53	x	0.7	=	2.71	(75)
Northeas	st _{0.9x}	0.3	x	2.6	×	11.28	x	0.53	x	0.7	j =	2.94	(75)
Northeas	st _{0.9x}	0.3	x	2.4	x	22.97	x	0.53	x	0.7	j =	5.52	(75)
Northeas	st _{0.9x}	0.3	×	2.6	×	22.97	x	0.53	x	0.7	=	5.98	(75)
Northeas	st _{0.9x}	0.3	×	2.4	x	41.38	x	0.53	x	0.7	j =	9.95	(75)
Northeas	st _{0.9x}	0.3	×	2.6	x	41.38	x	0.53	x	0.7	=	10.78	(75)
Northeas	st _{0.9x}	0.3	×	2.4	x	67.96	x	0.53	x	0.7	j =	16.34	(75)
	_		-		•		•		1		•		_

Northeast 0.9	x 0.3	X	2.6	;	x [67.96	X	0.53	X	0.7	=	17.7	(75)
Northeast 0.9	x 0.3	х	2.4		x	91.35	X	0.53	X	0.7	=	21.96	(75)
Northeast 0.9	x 0.3	х	2.6		x [91.35	X	0.53	X	0.7	=	23.79	(75)
Northeast 0.9	x 0.3	x	2.4		x [97.38	X	0.53	x	0.7	=	23.41	(75)
Northeast 0.9	x 0.3	x	2.6		x [97.38	X	0.53	x	0.7	=	25.36	(75)
Northeast 0.9	x 0.3	х	2.4		x [91.1	X	0.53	x	0.7	=	21.9	(75)
Northeast 0.9	x 0.3	x	2.6		x [91.1	X	0.53	x	0.7	=	23.73	(75)
Northeast 0.9	x 0.3	x	2.4		x [72.63	X	0.53	x	0.7	=	17.46	(75)
Northeast 0.9	× 0.3	x	2.6		x [72.63	X	0.53	x	0.7	=	18.92	(75)
Northeast 0.9	x 0.3	X	2.4		x [50.42	X	0.53	X	0.7		12.12	(75)
Northeast 0.9	x 0.3	X	2.6		x [50.42	X	0.53	X	0.7	=	13.13	(75)
Northeast 0.9	x 0.3	X	2.4		x [28.07	X	0.53	X	0.7	=	6.75	(75)
Northeast 0.9	x 0.3	X	2.6		x [28.07	x	0.53	x	0.7	=	7.31	(75)
Northeast 0.9	x 0.3	X	2.4		x [14.2	X	0.53	X	0.7	=	3.41	(75)
Northeast 0.9	x 0.3	X	2.6		x [14.2	X	0.53	X	0.7	=	3.7	(75)
Northeast 0.9	x 0.3	X	2.4		x [9.21	x	0.53	x	0.7		2.22	(75)
Northeast 0.9	x 0.3	X	2.6		x [9.21	X	0.53	X	0.7	=	2.4	(75)
Solar gains	in watts, calc	culated	for each	month			(83)m	= Sum(74)m .	<mark>(8</mark> 2)m			,	
(83)m= 48.3		159.22		345.42		9.58 345.14	27	4 191.77	111.08	59.72	40.17		(83)
	– interna <mark>l and</mark>	_		` '	`							1	(0.4)
(84)m= 441.	65 484.4 <mark>1 5</mark>	538.33	615.81	684.72	689	9.49 652.38	E 0 C		1510	425.67	122 27		(84)
						5.45 652.66	586	85 514.72	454.03	423.07	423.27		(04)
7. Mean in	ternal tempe	rature (heating s	season)		5.43 002.00	300.	85 514.72	454.0	423.07	423.27		(04)
	ternal temper								454.0	423.07	423.27	21	(85)
Temperatu		ating pe	eriods in t	the livin	ng a	rea from Tab			454.0	423.07	423.21	21	
Temperatu	re during hea	ating pe	eriods in t	the livin	ng a (se	rea from Tab	ole 9,		Oct		Dec	21	
Temperatu Utilisation	re during hea	ating pe	eriods in t	the livin	ng a (se	rea from Tab e Table 9a) un Jul	ole 9,	Th1 (°C)				21	
Temperatu Utilisation Ja (86)m= 1	re during hear actor for gain	ating pens for li Mar 0.97	ving area Apr 0.88	the living a, h1,m May 0.67	ng a (see	rea from Table Table 9a) un Jul 45 0.33	ole 9,	Th1 (°C) ug Sep 8 0.65	Oct	Nov	Dec	21	(85)
Temperatu Utilisation Ja (86)m= 1	re during heat factor for gain n Feb 0.99	ating pens for li Mar 0.97	ving area Apr 0.88	the living a, h1,m May 0.67	ng a (see	rea from Table Table 9a) un Jul 45 0.33	ole 9,	Th1 (°C) ug Sep 8 0.65 able 9c)	Oct	Nov 0.99	Dec	21	(85)
Temperatu Utilisation Ja (86)m= 1 Mean inter (87)m= 20.3	re during heat factor for gain n Feb 0.99 nal temperat 9 20.5	ating pens for li Mar 0.97 ure in li 20.68	ving area Apr 0.88 iving area 20.9	the living a, h1,m May 0.67 a T1 (fo	(see	rea from Table Pa) un Jul 45 0.33 v steps 3 to 7	ole 9, 0.3 7 in T	Th1 (°C) ug Sep 8 0.65 able 9c) 1 20.99	Oct 0.93	Nov 0.99	Dec 1	21	(85)
Temperatu Utilisation Ja (86)m= 1 Mean inter (87)m= 20.3	re during heat actor for gain heat no.99 hal temperate 20.5	ating pens for li Mar 0.97 ure in li 20.68	Apr 0.88 iving area 20.9 eriods in t	the living a, h1,m May 0.67 a T1 (fo	(see	rea from Table Pa) un Jul 45 0.33 v steps 3 to 7 21 21 elling from Table	ole 9, 0.3 7 in T	Th1 (°C) ug Sep 8 0.65 able 9c) 1 20.99 9, Th2 (°C)	Oct 0.93	Nov 0.99 20.59	Dec 1	21	(85)
Temperatu Utilisation Ja (86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.3	re during heat actor for gain heat no.99 nal temperate 20.5 re during heat 1 20.31	ns for li Mar 0.97 ure in li 20.68 ating pe	Apr 0.88 iving area 20.9 eriods in 1 20.33	the living a, h1,m May 0.67 a T1 (for 20.99 rest of control 20.33	J 0.4 0.4 20	rea from Table 9a) un Jul 45 0.33 v steps 3 to 7 21 21 elling from Ta 34 20.34	Ole 9, O.3 7 in T 20 able 9	Th1 (°C) ug Sep 8 0.65 able 9c) 1 20.99 0, Th2 (°C)	Oct 0.93	Nov 0.99 20.59	Dec 1 20.37	21	(86)
Temperatu Utilisation Ja (86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.3	re during heat actor for gain heat no.99 hal temperate 20.5	ns for li Mar 0.97 ure in li 20.68 ating pe	Apr 0.88 iving area 20.9 eriods in 1 20.33	the living a, h1,m May 0.67 a T1 (for 20.99 rest of control 20.33	J 0.4 0.4 20	rea from Table Pa) un Jul 45 0.33 v steps 3 to 7 21 21 elling from Ta 34 20.34 n (see Table	Ole 9, O.3 7 in T 20 able 9	Th1 (°C) ug Sep 8 0.65 able 9c) 1 20.99 0, Th2 (°C) 35 20.34	Oct 0.93	Nov 0.99 20.59	Dec 1 20.37	21	(86)
Temperatu Utilisation Ja (86)m= 1 Mean inter (87)m= 20.3 Temperatu (88)m= 20.3 Utilisation (89)m= 1	re during hear factor for gain n Feb 0.99 nal temperate 9 20.5 re during hear 1 20.31 ractor for gain 0.99	ns for li Mar 0.97 ure in li 20.68 ating pe 20.31 ns for re 0.96	Apr 0.88 iving area 20.9 eriods in 1 20.33 est of dwo	the living a, h1,m May 0.67 a T1 (for 20.99 rest of control 20.33 relling, h 0.62	J 0 0 20 12,m 0	rea from Take Table 9a) un Jul 45 0.33 v steps 3 to 7 21 21 elling from Take 34 20.34 n (see Table 41 0.28	Al 0.3 7 in T 2 20.3 9a) 0.3	Th1 (°C) ug Sep 8 0.65 able 9c) 1 20.99 0, Th2 (°C) 35 20.34	Oct 0.93 20.86 20.33 0.91	Nov 0.99 20.59	Dec 1 20.37 20.32	21	(85) (86) (87) (88)
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(94)m=	0.99	tor for g	0.96	0.86	0.64	0.43	0.3	0.35	0.62	0.92	0.99	1		(94)
` ′ L		hmGm				00	0.0	0.00	0.02	0.02	0.00			,
(95)m=	439.12	478.57	518.6	527.46	439.18	295.11	197.53	206.48	318.58	415.79	419.62	421.41		(95)
Month	ly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
г		e for me				i	-``	- ` 	<u> </u>	r –		, ,		
(97)m=	804.69	777.61	704.39	583.13	445.56	295.37	197.55	206.52	322.1	493.67	657.67	796.18		(97)
. г	271.99	g require	138.23	r each m	10nth, k\ 4.74	r		 	i `	í - `	ŕ	270.02		
(98)m=	271.99	200.96	130.23	40.06	4.74	0	0	0 Tota	0	57.95	171.39 r) = Sum(9	278.83	1164.18	(98)
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	•	ace heat		•	•	`	,						1	(302)
		cheme ma neat pumps								up to four	other heat	sources; th	ne latter	
		at from C	-						\				1	(303a)
Fraction	n of tota	al space	heat from	m Comn	nunity he	eat pump				(3	02) x (303	a) =	1	(304a)
		trol and						unity hea	ating sys				1	(305)
Distribu	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m				ĺ	1.25	(306)
Space	heatin	a										L	kWh/year	_
-		heating	requiren	nent								[1164.18	
Space	heat fro	om Comi	munity h	eat pum	p				(98) x (30	04a) x (30	5) x (306)	=	1455.23	(307a)
Efficien	cy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment froi	m secon	dary/su	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water	heating	1										•		
		heating r	equirem	ent									2009.2	7
		ommuni												-
Water I	neat fro	m Comr	nunity he	eat pump)				(64) x (30	03a) x (30	5) x (306) :	= [2511.5	(310a)
Electric	ity use	d for hea	ıt distribu	ution				0.01	× [(307a)	(307e) +	· (310a)((310e)] =	39.67	(313)
Cooling	g Syste	m Energ	y Efficiei	ncy Ratio	0								0	(314)
Space	cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	- (314) =			0	(315)
		oumps a entilation						outside				[182.59	(330a)
warm a	ir heati	ng syste	m fans									ĺ	0	(330b)
pump f	or solar	water h	eating									j	0	(330g)
Total e	lectricit	y for the	above, k	«Wh/yea	r				=(330a) ·	+ (330b) +	(330g) =	j	182.59	(331)
												L		_

Energy for lighting (calculated in Appendix L)			311	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-461.08	(333)
Electricity generated by wind turbine (Appendix M) (negative qua	antity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission facto kg CO2/kWh	r Emissions kg CO2/year	,
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	g two fuels repeat (363) to	(366) for the second f	uel 319	(367a)
CO2 associated with heat source 1 [(307b)+((310b)] x 100 ÷ (367b) x	0.52	= 645.37	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 20.59	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	= 665.96	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		665.96	(376)
CO2 associated with electricity for pumps and fans within dwelling	ng (331)) x	0.52	94.76	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= 161.41	(379)
Energy saving/generation technologies (333) to (334) as application 1 Total CO2, kg/year sum of (376)(382) =	able	0.52 × 0.01 :	-239.3	(380)
Dwelling CO2 Emission Rate (383) ÷ (4) =			9.74	(384)
El rating (section 14)			92.05	(385)

	Us	ser Details:						
Assessor Name: Software Name: Stroma FSAP 2		Strom Softwa	are Ve	rsion:		Versic	n: 1.0.4.26	
Address The Cheville Date		erty Address:			N/4 OLUE			
Address: The Charlie Ratc 1. Overall dwelling dimensions:	niora Centre, E	sermont Stree	et, LONI	JON, INV	VIOHE			
The second second seconds		Area(m²)		Av. He	ight(m)		Volume(m³))
Ground floor		70.1	(1a) x	2	2.8	(2a) =	196.28	(3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1d)$	(1e)+(1n)	70.1	(4)			_		
Dwelling volume	L		(3a)+(3b)+(3c)+(3d)+(3e)+	.(3n) =	196.28	(5)
2. Ventilation rate:								
main heating	secondary heating	other		total			m³ per houi	r
Number of chimneys 0 +		0	_ = [0	X 4	40 =	0	(6a)
Number of open flues 0 +	0	+ 0] = [0	x 2	20 =	0	(6b)
Number of intermittent fans			Ī	3	x ′	10 =	30	(7a)
Number of passive vents			Ī	0	x ′	10 =	0	(7b)
Number of flueless gas fires			Ī	0	X 4	40 =	0	(7c)
						Air ch	anges per ho	ur
Infiltration due to chimneys, flues and fans =				30		÷ (5) =	0.15	(8)
If a pressurisation test has been carried out or is inte Number of storeys in the dwelling (ns)	naea, proceea to ((17), otnerwise (continue tr	om (9) to (16)		0	(9)
Additional infiltration					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timb	er frame or 0.3	5 for masonr	y constr	ruction			0	(11)
if both types of wall are present, use the value con deducting areas of openings); if equal user 0.35	responding to the	greater wall are	a (after					
If suspended wooden floor, enter 0.2 (unse	ealed) or 0.1 (s	sealed), else	enter 0				0	(12)
If no draught lobby, enter 0.05, else enter	0						0	(13)
Percentage of windows and doors draught	t stripped						0	(14)
Window infiltration		0.25 - [0.2	, ,	1			0	(15)
Infiltration rate		(8) + (10)					0	(16)
Air permeability value, q50, expressed in or If based on air permeability value, then (18) =	•	•	•	etre of e	nvelope	area	5	(17)
Air permeability value applies if a pressurisation test				is beina us	sed		0.4	(18)
Number of sides sheltered		g p					2	(19)
Shelter factor		(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporating shelter factor		(21) = (18)) x (20) =				0.34	(21)
Infiltration rate modified for monthly wind spe	eed		•		•	•	•	
Jan Feb Mar Apr Ma	ay Jun J	lul Aug	Sep	Oct	Nov	Dec		
Monthly average wind speed from Table 7			•		•	•	•	
(22)m= 5.1 5 4.9 4.4 4.3	3.8 3	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4								
(22a)m= 1.27 1.25 1.23 1.1 1.08	3 0.95 0.	.95 0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rate	e (allowi	ing for sl	nelter an	d wind s	speed) =	(21a) 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	0.4		
Calculate effe			rate for t	пе арріі	саріе са	se						0	(23
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with									, , ,			0	(23
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2:	2b)m + (23b) × [1 – (23c)		
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	лV) (24b	m = (22)	2b)m + (23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	ouse ext			•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)r	ventilation $1 = 1$, the			•	•				0.5]	!		•	
24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)			•	•	
25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25
3. Heat losse	s and he	eat loss r	naramet	er.					_			_	
ELEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	e	ΑΧk
	area	(m²)	'n	2	A ,r	n²	W/m2	2K	(W/I	K)	kJ/m²-	K	kJ/K
Doo <mark>rs</mark>					2.4	Х	1.2		2.88				(26
Vin <mark>dows</mark> Type	1				1.91	x1.	/[1/(1.4)+	0.04] =	2.53	Ц			(27
Vindows Type					1.76	x1.	/[1/(1.4)+	0.04] =	2.33	Ц			(27
Vindows Type	e 3				1.91	x1.	/[1/(1.4)+	0.04] =	2.53				(2
Vindows Type	e 4				1.91	х1.	/[1/(1.4)+	0.04] =	2.53				(2
Vindows Type	e 5				1.91	х1.	/[1/(1.4)+	0.04] =	2.53				(2
Valls Type1	22.9	6	17.5	3	5.43	X	0.18	=	0.98	\Box [(2
Valls Type2	8.12	2	0		8.12	Х	0.18	=	1.46				(2
Valls Type3	12.0	4	0		12.04	x	0.18	=	2.17				(2
otal area of e	elements	, m²			43.12	2							(3
for windows and						ated using	formula 1	!/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
* include the area				is and par	titions		(26)(30) ± (32) =					
abric heat los leat capacity		•	U)				(20)(00	, , ,	(30) + (32	2) + (225)	(320) -	27.54	
hermal mass	,	•	2 – Cm -	_ ΤΕΔ\ ir	n k I/m²K			., ,	tive Value	, , ,	(326) =	0	(3
or design assess	•	•		,			ecisely the				able 1f	250	(3
an be used inste					2.3 110	pi							
hermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						2.16	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	11)			(a=)	(0.0)				
otal fabric he									(36) =	/ > :		29.7	(3
entilation hea			· ·						= 0.33 × (1	<u> </u>	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m= 38.56 38.32 38.08 36.98 36.77 35.81 35.81 35.64 36.18 36.77 37.19 37	7.63 (38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m	
	7.33
Average = Sum(39) ₁₁₂ /1 Heat loss parameter (HLP), W/m ² K $ (40)m = (39)m \div (4) $	12= 66.68 (39)
(40)m= 0.97 0.97 0.97 0.95 0.95 0.93 0.93 0.93 0.94 0.95 0.95 0	0.96
Average = Sum(40) ₁₁₂ /1 Number of days in month (Table 1a)	12= 0.95 (40)
	Dec
(41)m= 31 28 31 30 31 30 31 30 31 30	31 (41)
4. Water heating energy requirement: kN	Wh/year:
Assumed occupancy, N 2 25	(42)
Assumed occupancy, N $= 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ if TFA £ 13.9, N = 1	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov I Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	Dec
	6.36
Total = Sum(44) ₁₋₁₂ =	1051.24 (44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)	` '
(45)m= 142.9 124.98 128.97 112.44 107.89 93.1 86.27 99 100.18 116.75 127.44 13	38.39
Total = Sum(45) ₁₁₂ = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	1378.34 (45)
	0.76 (46)
Water storage loss:	5.76
Storage volume (litres) including any solar or WWHRS storage within same vessel 150	(47)
If community heating and no tank in dwelling, enter 110 litres in (47)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year $(48) \times (49) = 0.75$	(50)
b) If manufacturer's declared cylinder loss factor is not known:	
Hot water storage loss factor from Table 2 (kWh/litre/day)	(51)
If community heating see section 4.3 Volume factor from Table 2a	(50)
Temperature factor from Table 2b	(52)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$	(54)
Enter (50) or (54) in (55)	(55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	3.33 (56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from A	ppendix H
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	3.33 (57)

Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$	
(61)m= 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)n$	1
(62)m= 189.5 167.07 175.57 157.53 154.49 138.19 132.87 145.59 145.27 163.35 172.53 184.99	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 189.5 167.07 175.57 157.53 154.49 138.19 132.87 145.59 145.27 163.35 172.53 184.99	
Output from water heater (annual) ₁₁₂ 1926.95	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 84.79 75.23 80.16 73.46 73.15 67.03 65.96 70.19 69.38 76.1 78.45 83.29	(65)
include (57)m in-calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43 112.43	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 17.62 15.65 12.73 9.64 7.2 6.08 6.57 8.54 11.46 14.55 16.99 18.11	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 197.53 199.58 194.41 183.42 169.54 156.49 147.78 145.73 150.89 161.89 175.77 188.81	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24 34.24	(69)
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94 -89.94	(71)
Water heating gains (Table 5)	
(72)m= 113.97 111.94 107.74 102.03 98.32 93.1 88.66 94.35 96.37 102.28 108.96 111.95	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 388.85 386.9 374.61 354.81 334.79 315.4 302.73 308.34 318.45 338.45 361.44 378.6	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6d m² Table 6a Table 6b Table 6c (W)	
North 0.9x 0.77 x 1.91 x 10.63 x 0.63 x 0.7 = 12.41	(74)
North 0.9x 0.77 x 1.91 x 10.63 x 0.63 x 0.7 = 12.41	(74)

North		_		_		_						_		_
North	North	0.9x	0.77	X	1.91	X	10.63	X	0.63	X	0.7	=	12.41	(74)
North	North	0.9x	0.77	X	1.91	x	20.32	X	0.63	X	0.7	=	23.72	(74)
North	North	0.9x	0.77	X	1.91	X	20.32	x	0.63	X	0.7	=	23.72	(74)
North	North	0.9x	0.77	X	1.91	x	20.32	x	0.63	X	0.7	=	23.72	(74)
North	North	0.9x	0.77	X	1.91	x	34.53	X	0.63	X	0.7	=	40.31	(74)
North	North	0.9x	0.77	X	1.91	X	34.53	X	0.63	X	0.7	=	40.31	(74)
North	North	0.9x	0.77	X	1.91	x	34.53	X	0.63	X	0.7	=	40.31	(74)
North	North	0.9x	0.77	X	1.91	x	55.46	x	0.63	X	0.7	=	64.75	(74)
North	North	0.9x	0.77	X	1.91	x	55.46	X	0.63	X	0.7	=	64.75	(74)
North	North	0.9x	0.77	X	1.91	x	55.46	X	0.63	X	0.7	=	64.75	(74)
North	North	0.9x	0.77	X	1.91	x	74.72	X	0.63	X	0.7	=	87.23	(74)
North	North	0.9x	0.77	X	1.91	X	74.72	X	0.63	X	0.7	=	87.23	(74)
North	North	0.9x	0.77	X	1.91	x	74.72	x	0.63	X	0.7	=	87.23	(74)
North	North	0.9x	0.77	X	1.91	x	79.99	X	0.63	X	0.7	=	93.38	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	79.99	X	0.63	X	0.7	=	93.38	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	79.99	x	0.63	X	0.7	=	93.38	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	X	74.68	X	0.63	X	0.7	=	87.18	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	X	74.68	Х	0.63	X	0.7	=	87.18	(74)
North 0.9x 0.77 x 1.91 x 59.26 x 0.63 x 0.7 = 69.17 (74) North 0.9x 0.77 x 1.91 x 41.52 x 0.63 x 0.7 = 48.47 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 24.19 x 0.63 x 0.7 = 28.24 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) Northeast 0.9x 0.3 x 1.76 x 11.28 x 0.63 x 0.7 = 2.57 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75)	North	0.9x	0.77	x	1.91	х	74.68	x	0.63	x	0.7	=	87.18	(74)
North	North	0.9x	0.77	x	1.91	х	59.25	x	0.63	x	0.7	=	69.17	(74)
North	North	0.9x	0.77	X	1.91	X	59.25	X	0.63	x	0.7	=	69.17	(74)
North	North	0.9x	0.77	x	1.91	x	59.2 <mark>5</mark>	Х	0.63	x	0.7	=	69.17	(74)
North	North	0.9x	0.77	x	1.91	x	41.52	X	0.63	x	0.7	=	48.47	(74)
North	North	0.9x	0.77	X	1.91	х	41.52	x	0.63	x	0.7	=	48.47	(74)
North	North	0.9x	0.77	X	1.91	x	41.52	x	0.63	X	0.7	=	48.47	(74)
North	North	0.9x	0.77	X	1.91	X	24.19	X	0.63	X	0.7	=	28.24	(74)
North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) Northeast 0.9x 0.3 x 1.76 x 11.28 x 0.63 x 0.7 = 2.36 (75) Northeast 0.9x 0.3 x 1.76 x 11.28 x 0.63 x 0.7 = 2.57 (75) Northeast 0.9x 0.3 x 1.76 x 22.97 x 0.63 x 0.7 = 2.57 (75) Northeast 0.9x 0.3 x 1.91 x 22.97 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 5.22 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 8.67 (75) Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 9.41 (75)	North	0.9x	0.77	X	1.91	x	24.19	X	0.63	X	0.7	=	28.24	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	24.19	x	0.63	X	0.7	=	28.24	(74)
North 0.9x 0.77 x 1.91 x 13.12 x 0.63 x 0.7 = 15.31 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) North 0.9x 0.77 x 1.91 x 8.86 x 0.63 x 0.7 = 10.35 (74) Northeast 0.9x 0.3 x 1.76 x 11.28 x 0.63 x 0.7 = 2.36 (75) Northeast 0.9x 0.3 x 1.76 x 22.97 x 0.63 x 0.7 = 2.57 (75) Northeast 0.9x 0.3 x 1.76 x 22.97 <td>North</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.91</td> <td>x</td> <td>13.12</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>15.31</td> <td>(74)</td>	North	0.9x	0.77	X	1.91	x	13.12	X	0.63	X	0.7	=	15.31	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	13.12	X	0.63	X	0.7	=	15.31	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	13.12	x	0.63	X	0.7	=	15.31	(74)
North 0.9x 0.77	North	0.9x	0.77	X	1.91	x	8.86	x	0.63	X	0.7	=	10.35	(74)
Northeast 0.9x	North	0.9x	0.77	X	1.91	x	8.86	x	0.63	X	0.7	=	10.35	(74)
Northeast 0.9x	North	0.9x	0.77	x	1.91	x	8.86	x	0.63	X	0.7	=	10.35	(74)
Northeast 0.9x	Northeas	st _{0.9x}	0.3	X	1.76	x	11.28	x	0.63	X	0.7	=	2.36	(75)
Northeast 0.9x	Northeas	st _{0.9x}	0.3	X	1.91	x	11.28	X	0.63	X	0.7	=	2.57	(75)
Northeast 0.9x 0.3 x 1.76 x 41.38 x 0.63 x 0.7 = 8.67 (75) Northeast 0.9x 0.3 x 1.91 x 41.38 x 0.63 x 0.7 = 9.41 (75)	Northeas	st _{0.9x}	0.3	x	1.76	x	22.97	x	0.63	x	0.7	=	4.81	(75)
Northeast 0.9x 0.3 x 1.91 x 41.38 x 0.63 x 0.7 = 9.41 (75)	Northeas	st _{0.9x}	0.3	X	1.91	x	22.97	x	0.63	x	0.7	=	5.22	(75)
	Northeas	st _{0.9x}	0.3	X	1.76	x	41.38	x	0.63	x	0.7	=	8.67	(75)
Northeast 0.9x 0.3 x 1.76 x 67.96 x 0.63 x 0.7 = 14.24 (75)	Northeas	st _{0.9x}	0.3	x	1.91	x	41.38	x	0.63	X	0.7	=	9.41	(75)
	Northeas	st 0.9x	0.3	x	1.76	x	67.96	x	0.63	X	0.7	=	14.24	(75)

Northeast _{0.9x}	0.3	X	1.91	1	x [67.96	X	0.63	X	0.7	=	15.45	(75)
Northeast _{0.9x}	0.3	x	1.76	3	x [91.35	x	0.63	x	0.7	=	19.14	(75)
Northeast _{0.9x}	0.3	x	1.91	1	x [91.35	X	0.63	x	0.7	=	20.77	(75)
Northeast _{0.9x}	0.3	X	1.76	3	x [97.38	X	0.63	x	0.7	=	20.41	(75)
Northeast _{0.9x}	0.3	×	1.91	1	x [97.38	X	0.63	×	0.7	=	22.15	(75)
Northeast _{0.9x}	0.3	x	1.76	6	x [91.1	X	0.63	x	0.7	=	19.09	(75)
Northeast 0.9x	0.3	×	1.91	1	x [91.1	X	0.63	x	0.7	=	20.72	(75)
Northeast _{0.9x}	0.3	×	1.76	6	x [72.63	X	0.63	×	0.7	=	15.22	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x [72.63	X	0.63	X	0.7	=	16.52	(75)
Northeast 0.9x	0.3	X	1.76	6	x [50.42	x	0.63	X	0.7	=	10.57	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x [50.42	x	0.63	X	0.7	=	11.47	(75)
Northeast _{0.9x}	0.3	X	1.76	6	x [28.07	x	0.63	X	0.7	=	5.88	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x [28.07	x	0.63	X	0.7	=	6.38	(75)
Northeast _{0.9x}	0.3	X	1.76	6	x [14.2	x	0.63	X	0.7	=	2.98	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x [14.2	X	0.63	X	0.7	=	3.23	(75)
Northeast _{0.9x}	0.3	X	1.76	ô	x [9.21	x	0.63	X	0.7	=	1.93	(75)
Northeast _{0.9x}	0.3	X	1.91	1	x	9.21	x	0.63	X	0.7	=	2.1	(75)
Solar gains in							<u>` </u>	= Sum(74)m .	(82)m	_		,	
(83)m= 42.17		39.02	223.95	301.6		2.69 301.35	239	.24 167.44	96.98	52.15	35.07		(83)
Total gains – i		_	<u>` </u>	` '		/ 	V		45-4			1	(0.4)
(84)m= 431.02	468.11 51	3.63	578.76	636.38	638	8.09 604.08	547	.58 485.89	435.43	3 413.59	413.68		(84)
						-						J	
7. Mean inter	nal tempera	ature (heating	season)									
7. Mean inter						rea from Tab	ole 9,					21	(85)
	during hea	ting pe	eriods in	the livir	ng a		ole 9,					21	(85)
Temperature	during hea	ting pe	eriods in	the livir	ng a (se		ı		Oct	Nov	Dec	21	(85)
Temperature Utilisation fac	during heat ctor for gain	ting pe	eriods in ving area	the livir	ng a (se	e Table 9a)	ı	Th1 (°C)		Nov 1		21	(85)
Temperature Utilisation fac	during hea ctor for gain: Feb	ting pe s for li Mar	ving area Apr 0.96	the livir a, h1,m May	ng a (se J	e Table 9a) un Jul 64 0.47	0.5	Th1 (°C) ug Sep 4 0.83	Oct	-	Dec	21	
Temperature Utilisation fac Jan (86)m= 1	during hea	ting pe s for li Mar	ving area Apr 0.96	the livir a, h1,m May	ng a (se J o.	e Table 9a) un Jul 64 0.47	0.5	Th1 (°C) ug Sep 4 0.83 Table 9c)	Oct	1	Dec	21	
Temperature Utilisation fac Jan (86)m= 1 Mean interna	tor for gains Feb 1 0 1 temperatu 20.13 2	s for li Mar 0.99	ving area Apr 0.96 iving are 20.65	the living a, h1,m May 0.84 a T1 (for 20.89	(se J 0. ollow	e Table 9a) un Jul 64 0.47 v steps 3 to 7	0.57 in T	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93	Oct 0.97	1	Dec 1	21	(86)
Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 20.02	during hear ctor for gains Feb 1 0 1 temperatu 20.13 2 during hear	s for li Mar 0.99	ving area Apr 0.96 iving are 20.65	the living a, h1,m May 0.84 a T1 (for 20.89	(se J 0. 20	e Table 9a) un Jul 64 0.47 v steps 3 to 7	0.57 in T	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93 9, Th2 (°C)	Oct 0.97	1 20.28	Dec 1	21	(86)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11	during hear ctor for gains Feb 1 0 1 temperatu 20.13 2 during hear 20.11 2	s for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for	ving area Apr 0.96 iving are 20.65 eriods in	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13	(se J 0. billow 20	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14	Ai 0.57 in T 20.42 able 9 20.	Th1 (°C) ug Sep 4 0.83 able 9c) 99 20.93 9, Th2 (°C)	Oct 0.97	20.28	Dec 1 20	21	(86)
Temperature Utilisation factors Jan (86)m= 1 Mean internations (87)m= 20.02 Temperature	during hear ctor for gain. Feb 1	s for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for ling persons for	ving area Apr 0.96 iving are 20.65 eriods in	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13	ng a (se J o. o. o. o. o. o. o. o. o. o. o. o. o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14	Ai 0.57 in T 20.42 able 9 20.	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 9, Th2 (°C) 14 20.13	Oct 0.97	20.28	Dec 1 20		(86)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation factors (89)m= 1	during hear ctor for gains Feb 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re	ving area Apr 0.96 iving are 20.65 eriods in 20.12 est of dw	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8	ong a (see	e Table 9a) un Jul 64 0.47 v steps 3 to 7 0.98 21 elling from Ta 0.14 20.14 n (see Table 56 0.38	Au 0.5 7 in T 20.3 able 9 20. 9a) 0.4	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 0, Th2 (°C) 14 20.13	Oct 0.97 20.63 20.13	20.28	Dec 1 20 20.12	21	(86) (87) (88)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fact (89)m= 1 Mean internation	during hear tor for gains feb 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	s for li Mar 0.99 re in li 0.34 ting per 0.11 s for re 0.98 re in t	ving are Apr 0.96 iving are 20.65 eriods in 20.12 est of dw 0.94 he rest of	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8 of dwelling the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living and the living	(se J 0. o. o. o. o. o. o. o. o. o. o. o. o. o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 1.98 21 elling from Ta 1.14 20.14 n (see Table 56 0.38	Ai 0.57 in T 20.94 20. 9a) 0.4	Th1 (°C) ug Sep 4 0.83 fable 9c) 99 20.93 0, Th2 (°C) 14 20.13 4 0.76 to 7 in Tabl	Oct 0.97 20.63 20.13 0.96 e 9c)	20.28	Dec 1 20 20.12		(86) (87) (88) (89)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation factors (89)m= 1	during hear tor for gains feb 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re	ving area Apr 0.96 iving are 20.65 eriods in 20.12 est of dw	the living a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8	(se J 0. o. o. o. o. o. o. o. o. o. o. o. o. o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 0.98 21 elling from Ta 0.14 20.14 n (see Table 56 0.38	Au 0.5 7 in T 20.3 able 9 20. 9a) 0.4	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 0, Th2 (°C) 14 20.13 4 0.76 to 7 in Table 14 20.07	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69	20.28	Dec 1 20 20.12 1 18.78		(86) (87) (88) (89)
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Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fact (89)m= 1 Mean internation (90)m= 18.79 Mean internation (92)m= 19.34 Apply adjustit (93)m= 19.34	during hear ctor for gains Feb 1	s for li Mar 0.99 re in li 0.34 ting pe 0.11 s for re 0.98 re in t 9.26 re (for 9.75 mean 9.75 mean ement nal terr	ving are Apr 0.96 iving are 20.65 eriods in 20.12 est of dw 0.94 he rest of 19.71 r the who 20.13 internal 20.13	the livir a, h1,m May 0.84 a T1 (for 20.89 rest of 20.13 velling, h 0.8 of dwelling 20.02 ble dwel 20.41 tempera 20.41 e obtain	ong a (se J o. o. o. o. o. o. o. o. o. o. o. o. o.	e Table 9a) un Jul 64 0.47 v steps 3 to 7 .98 21 elling from Ta .14 20.14 n (see Table 56 0.38 F2 (follow ste .13 20.14) = fLA × T1 .51 20.52 e from Table .51 20.52	All 0.57 in T 20.0. 4 able 9 20. 9a) 0.4 eps 3 20. + (1 20.0. 4 4e, 1 20.0. 20.0. - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4 20.0 - 4	Th1 (°C) ug Sep 4 0.83 Table 9c) 99 20.93 0, Th2 (°C) 14 20.13 4 0.76 to 7 in Tabl 14 20.07 f — fLA) × T2 52 20.46 where approx 52 20.46	Oct 0.97 20.63 20.13 0.96 e 9c) 19.69 LA = Liv	1 20.28 20.12 0.99 19.19 ving area ÷ (4	Dec 1 20 20.12 1 18.78 4) =	0.45	(86) (87) (88) (89) (90) (91)

Apr

May

Jul

Jun

Aug

Mar

Jan

Feb

Oct

Sep

Nov

Dec

l Itilicati	ion facto	r for as	aine hm											
(94)m=		0.99	0.98	0.94	0.81	0.59	0.42	0.49	0.79	0.96	0.99	1		(94)
	gains, hr													, ,
_		64.84	504.77	543.8	516.25	379.24	256.14	267.38	381.5	419.07	410.26	412.38		(95)
Monthly	y averag	e exte	rnal tem	perature	from Ta	able 8		l .			l .			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat lo	ss rate f	or mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1	1026.69	91.85	898.06	748.8	578.78	387.28	257.06	269.38	418.8	632.31	841.31	1018.56		(97)
· -	heating I						th = 0.02	24 x [(97))m – (95	- `	 		l	
(98)m=	444.44 3	354.15	292.61	147.6	46.52	0	0	0	0	158.65	310.35	451		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2205.32	(98)
Space	heating i	require	ement in	kWh/m²	/year								31.46	(99)
9a. Enei	rgy requi	remen	ts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space	heating	:												_
Fractio	n of spac	ce hea	t from se	econdar	//supple	mentary	system						0	(201)
Fractio	n of spac	ce hea	t from m	ain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fractio	n of total	heatir	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficier	ncy of ma	ain spa	ce heati	ng syste	em 1								93.5	(206)
Efficier	ncy of se	condar	y/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
Space	heating i	require	ement (c	alculate	d above)									
	444.44 3	354.15	292.61	147.6	46.52	0	0	0	0	158.65	310.35	451		
(211)m :	= {[(98)m	x (20	4)] } x 1	00 ÷ (20	6)									(211)
	475.34 3	78.76	312.95	157.86	49.76	0	0	0	0	169.68	331.93	482.35		
								Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	_	2358.63	(211)
•	heating f	`	•	, , .	month									
	n x (201)												1	
(215)m=	0	0	0	0	0	0	0	0 T-1-	0	0	0	0		7
								rota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water h	_	or boot	or (color	ام امداما	20110)									
	rom wate	67.07	175.57	157.53	154.49	138.19	132.87	145.59	145.27	163.35	172.53	184.99		
Efficienc	cy of wate	er hea	ter									<u> </u>	79.8	(216)
(217)m=	87.01	86.77	86.17	84.64	82.05	79.8	79.8	79.8	79.8	84.74	86.36	87.1		(217)
∟ Fuel for	water he	eating,	kWh/mc	onth			ļ	<u> </u>	ļ	ļ	<u> </u>	<u> </u>		
(219)m :	= (64)m	x 100	÷ (217)	m									l	
(219)m=	217.78 1	92.54	203.75	186.12	188.29	173.17	166.5	182.45	182.05	192.77	199.78	212.38		_
	_							Tota	I = Sum(2			l	2297.59	(219)
Annual Space h	totals neating fu	مور امر	d main	evetem	1					k\	Wh/year	[kWh/year 2358.63	
•	•			Jysieiii	•							[
	eating fu												2297.59	
Electrici	ty for pur	mps, fa	ans and	electric	keep-ho	t								

central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting			311.17	(232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	509.46 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	496.28 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1005.74 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	161.5 (268)
Total CO2, kg/year	sum	of (265)(271) =	1206.17 (272)



		User D	etails:						
Assessor Name:	01 F0AD 0040		Stroma				\	4.0.4.00	
Software Name:	Stroma FSAP 2012	Property A	Softwa Address:			n	versic	on: 1.0.4.26	
Address :	The Charlie Ratchford Cent								
1. Overall dwelling dime		,		, 2011					
		Area	a(m²)		Av. He	ight(m)		Volume(m³))
Ground floor		3	39.2	(1a) x	2	2.8	(2a) =	109.76	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 3	39.2	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	109.76	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	٢
Number of chimneys	0 + 0	+	0	= [0	X ·	40 =	0	(6a)
Number of open flues	0 + 0	+	0	= [0	x	20 =	0	(6b)
Number of intermittent far	ns			Ī	0	x	10 =	0	(7a)
Number of passive vents				Ī	0	×	10 =	0	(7b)
Number of flueless gas fin	res			Ī	0	X ·	40 =	0	(7c)
				_			A : I-		
				_		<u> </u>	Air cn	nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b			ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		eu 10 (17), C	ou iei wise c	onunue ii	om (9) to ((10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	.25 for steel or timber frame o	r 0.35 for	masonr	y constr	uction			0	(11)
	resent, use the value corresponding to	o the great	er wall area	a (after					
deducting areas of opening	ngs); if equal user 0.35 loor, enter 0.2 (unsealed) or 0	1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, ent	,	TT (OGGIO	, a,, c.cc	ornor 0				0	(13)
•	and doors draught stripped							0	 (14)
Window infiltration	.		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	es per ho	our per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] + ($	(8), otherwi	se (18) = (16)				0.15	(18)
	s if a pressurisation test has been do	ne or a deg	gree air per	meability	is being u	sed			_
Number of sides sheltere Shelter factor	d		(20) = 1 - [0.075 x (1	19)1 =			2	(19)
Infiltration rate incorporati	ing shelter factor		(21) = (18)		. •/]			0.85	$\frac{1}{2}$ (20)
Infiltration rate modified for			(=:)	x (20)				0.13	(21)
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				•	1		1	<u> </u>	
 	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
L	2) 4	1			1	1	1	I	
Wind Factor (22a)m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m =		0.05	0.02	- 1	1.00	1 10	1 10	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	I	

0.16	0.16	e (allowi	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effe		_	rate for t	he appli	cable ca	se Se	<u> </u>			<u> </u>	ļ]	
If mechanica												0.5	(2:
If exhaust air h) = (23a)			0.5	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				76.5	(2
a) If balance	ı —					- ` ` 		<u> </u>	2b)m + (23b) × [``	÷ 100]	
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
b) If balance	ı —						<u> </u>	,	<u> </u>		1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00h	. \			
$\frac{11 (220)f}{24c)m=0}$	0.5 x	(23b), t	nen (240	(230) = (230)	o); other	wise (24)	C) = (220)	0) m + 0.	5 × (230	0	0	1	(2
	<u> </u>					<u> </u>			0				(2
d) If natural if (22b)r		on or wn en (24d)			•				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)				ı	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
3. Heat losse					N . A				A >/ L L				
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valu W/m2		A X U (W/I	K)	k-value kJ/m²-l		AXk J/K
oors Type 1	5.11				2.5	x	1.3	= [3.25	7			(2
oors Type 2					2.5	X	1	-	2.5	Ħ			(2
/indows Type	1				4.1	7 v1	/[1/(1.3)+		5.07	Ħ			(2
/indows Type					2.6		/[1/(1.3)+		3.21	4			(2
/indows Type						_	/[1/(1.3)+	L		=			(2
/alls			- 40	_	1.3	=			1.61	륵 ,			`
	29.1	==	13	_	16.12	=	0.15	= [2.42	亅 ¦		╡	(2
oof	39.2		0		39.2	×	0.1	=	3.92				(3
otal area of e		,			68.32			<i>r</i>					(3
for windows and include the area						ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	1 3.2	
abric heat los							(26)(30)	+ (32) =				21.97	(;
eat capacity	•	`	,					((28)	.(30) + (32	2) + (32a).	(32e) =	0	<u> </u>
hermal mass	^	` ,	P = Cm ÷	- TFA) ir	n kJ/m²K			., ,	tive Value	, , ,	, ,	250	
or design assess	•	,		•			ecisely the	indicative	values of	TMP in Ta	able 1f	200	(
an be used inste						·	•						
nermal bridg	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						3.42	(:
details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(00)	(0.0)				
otal fabric he									(36) =			25.39	(;
	i	i								25)m x (5)	1	1	
	ı Lah	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan	Feb												
Jan	10.03	9.91	9.34	9.22	8.64	8.64	8.53	8.87	9.22	9.45	9.68		(;
	10.03		9.34	9.22	8.64	8.64	8.53		9.22	<u> </u>	9.68		(3

at loss pa	rameter (HLP), W/	m²K		T	ı	1	(40)m	= (39)m ÷	- (4)	ı	Ī	
)m= 0.91	0.9	0.9	0.89	0.88	0.87	0.87	0.87	0.87	0.88	0.89	0.89		
ımber of d	ave in mo	nth (Tah	(12 ما					,	Average =	Sum(40) ₁	12 /12=	0.89	(
Jar	<u> </u>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(
,		<u> </u>									<u> </u>		`
. Water he	ating ene	rgy requi	rement:								kWh/ye	ear:	
sumed oc if TFA > 1: if TFA £ 1:	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		39		(
nual avera duce the and more that 1	nual average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		7.1		(
Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usag	e in litres pe	r day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)						
)m= 73.8°	71.13	68.44	65.76	63.07	60.39	60.39	63.07	65.76	68.44	71.13	73.81		
orgy contont	of hot water	usad cal	culated ma	onthly - 1	100 v Vd r	n v nm v [Tm / 2600			m(44) ₁₁₂ =		805.19	_
				-									
m= 109.4	6 95.73	98.79	86.12	82.64	71.31	66.08	75.83	76.73	89.43	97.61 m(45) ₁₁₂ =	106	1055.74	1
stantaneous	s water heat	ing at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Total = Su	III(43)112 =		1055.74	
)m= 16.42	2 14.36	14.82	12.92	12.4	10.7	9.91	11.37	11.51	13.41	14.64	15.9		
iter storaç											!		
orage volu								ame vės	sel		150		
-	heating a no stored			•			` '	ore) onto	or 'O' in <i>(</i>	′ 17 \			
ater storaç		not wate	i (uno n	iciuues i	Holaniai	ieous cc	ווטט וטוווו	ers) erite	51 0 111 ((47)			
-	, icturer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	63		
mperature	factor fro	m Table	2b							0	.6		
ergy lost f	rom wate	r storage	, kWh/ye	ear			(48) x (49)	=		0.	.98		
	cturer's d		-									i I	
	orage loss heating s			e 2 (KVV	h/litre/da	ıy)					0		
-	or from Ta		JII 4.3								0		
	factor fro		2b							-	0		
erav lost 1	rom wate	r storage	. kWh/ve	ear			(47) x (51)	x (52) x (53) =		0		
••	r (54) in (_	,					, , ,	,	-	.98		
iter storaç	je loss ca	culated f	or each	month			((56)m = (55) × (41):	m			l	
m= 30.32	2 27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		
	ins dedicate											l ix H	
m= 30.32	2 27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		
	uit loog /s:		Table				ı	<u> </u>	ı		0		
mary circ													
mary circo	,	•			59)m = ((58) ± 36	35 × (41)	m			0		
mary circ	uit loss (ar uit loss ca by factor f	culated f	for each	month (. ,	, ,		r thermo		0		

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0 0	00) -	0) 0		0	0	0	0	1	(61)
													J (59)m + (61)m	(-)
(62)m= 163.0	-i	152.37	137.98	136.22	123.1		129.	_	128.59	143.01	` 	159.58]	(62)
Solar DHW inpo													J	(-)
(add addition											mon to wat	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from	water hea	ter				·						<u> </u>	J	
(64)m= 163.0		152.37	137.98	136.22	123.1	6 119.66	129.	.41	128.59	143.01	149.47	159.58]	
	I	<u>!</u>	<u> </u>	ļ.				Outp	out from wa	ater heat	_ I er (annual)₁	112	1686.6	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.8	35 × (45)m	ı + (6	1)m	n] + 0.8 x	((46)n	n + (57)m	+ (59)m	1]	-
(65)m= 79.20		75.71	70.12	70.34	65.19		68.0		67	72.6	73.94	78.11	اُ	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	vlinde	r is in the	dwelli	ing	or hot w	ater is	from com	munity h	ı neating	
5. Internal					,							,		
Metabolic ga				,										
Jar		Mar	Apr	May	Jur	n Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 69.26	6 69.26	69.26	69.26	69.26	69.20	69.26	69.2	26	69.26	69.26	69.26	69.26		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a),	lso s	ee	Table 5					
(67)m= 10.66	6 9.47	7.7	5.83	4.36	3.68	3.97	5.1	7	6.93	8.8	10.28	10.95		(67)
Appliances (gains (ca <mark>lc</mark>	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5				
(68)m= 119.5	3 120.77	117.64	110.99	102.59	94.69	89.42	88.′	18	91.31	97.96	106.36	114.25		(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a), also	o se	e Table	5		•		
(69)m= 29.93	3 29.93	29.93	29.93	29.93	29.9	3 29.93	29.9	93	29.93	29.93	29.93	29.93		(69)
Pumps and	fans gains	(Table 5	5a)								•	•	• —	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•					•	•	•	
(71)m= -55.4	1 -55.41	-55.41	-55.41	-55.41	-55.4	1 -55.41	-55.	41	-55.41	-55.41	-55.41	-55.41]	(71)
Water heatir	ng gains (T	able 5)				•					•		•	
(72)m= 106.5	3 104.98	101.76	97.39	94.55	90.5	87.15	91.	5	93.05	97.58	102.69	104.99]	(72)
Total intern	al gains =				(66)m + (67)n	n + (68	3)m +	+ (69)m + ((70)m + (71)m + (72))m	-	
(73)m= 280.4	9 278.99	270.88	257.98	245.27	232.	7 224.32	228.	.63	235.07	248.12	263.1	273.97]	(73)
6. Solar ga	ins:													
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and ass	ociated equa	tions t	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			Flux Fable 6a		_	g_ able 6b	-	FF Fable 6c		Gains	
_						able ba			able ob	_ ,	able 60		(W)	,
East 0.9	_	X	1.	3	× _	19.64	X		0.53	x [8.0	=	2.92	(76)
East 0.9		X	1.	3	x	38.42	X		0.53	x [0.8	=	5.72	(76)
East 0.9		X	1.	3	× L	63.27	X		0.53	× [0.8	=	9.42	(76)
East 0.9		X	1.	3	x _	92.28	X		0.53	× [0.8	=	13.73	(76)
East 0.9	x 0.3	X	1.	3	x	113.09	X		0.53	X	8.0	=	16.83	(76)

	_								_			_				_
East	0.9x	0.3		X	1.3		X	115.77	X		0.53	X	0.8	=	17.23	(76)
East	0.9x	0.3		X	1.3		X	110.22	X		0.53	X	0.8	=	16.4	(76)
East	0.9x	0.3		X	1.3		X	94.68	X		0.53	X	0.8	=	14.09	(76)
East	0.9x	0.3		X	1.3		X	73.59	X		0.53	X	0.8	=	10.95	(76)
East	0.9x	0.3		X	1.3		x	45.59	X		0.53	X	0.8	=	6.78	(76)
East	0.9x	0.3		X	1.3		x	24.49	X		0.53	X	0.8	=	3.64	(76)
East	0.9x	0.3		X	1.3		x	16.15	X		0.53	X	0.8	=	2.4	(76)
West	0.9x	0.77		X	4.1		x	19.64	X		0.53	X	0.7	=	20.7	(80)
West	0.9x	0.3		X	2.6		x	19.64	X		0.53	X	0.8	=	5.85	(80)
West	0.9x	0.77		X	4.1		x	38.42	X		0.53	X	0.7	=	40.5	(80)
West	0.9x	0.3		X	2.6		x	38.42	X		0.53	х	0.8	=	11.44	(80)
West	0.9x	0.77		X	4.1		x	63.27	X		0.53	X	0.7	=	66.7	(80)
West	0.9x	0.3		X	2.6		x	63.27	X		0.53	X	0.8	=	18.83	(80)
West	0.9x	0.77		X	4.1		x	92.28	X		0.53	х	0.7	=	97.27	(80)
West	0.9x	0.3		X	2.6		x	92.28	X		0.53	х	0.8	=	27.47	(80)
West	0.9x	0.77		X	4.1		x	113.09	X		0.53	X	0.7	=	119.21	(80)
West	0.9x	0.3		X	2.6		x	113.09	X		0.53	х	0.8	=	33.66	(80)
West	0.9x	0.77		X	4.1		x	115.77	X		0.53	Х	0.7	=	122.04	(80)
West	0.9x	0.3		X	2.6		x	115.77	x		0.53	х	0.8	=	34.46	(80)
West	0.9x	0.77		X	4.1		x	110.22] ×		0.53	x	0.7	=	116.18	(80)
West	0.9x	0.3		X	2.6		X	110.22	X		0.53	X	0.8	=	32.81	(80)
West	0.9x	0.77		X	4.1		x	94.68	Х		0.53	х	0.7	=	99.8	(80)
West	0.9x	0.3		X	2.6	7	x	94.68	X		0.53	х	0.8	=	28.18	(80)
West	0.9x	0.77		X	4.1		X	73.59	X		0.53	x	0.7	=	77.57	(80)
West	0.9x	0.3		X	2.6		x	73.59	X		0.53	х	0.8	=	21.9	(80)
West	0.9x	0.77		X	4.1		X	45.59	X		0.53	X	0.7	=	48.06	(80)
West	0.9x	0.3		X	2.6		X	45.59	X		0.53	X	0.8	=	13.57	(80)
West	0.9x	0.77		X	4.1		x	24.49	X		0.53	X	0.7	=	25.81	(80)
West	0.9x	0.3		X	2.6		x	24.49	X		0.53	X	0.8	=	7.29	(80)
West	0.9x	0.77		X	4.1		x	16.15	X		0.53	X	0.7	=	17.03	(80)
West	0.9x	0.3		X	2.6		X	16.15	X		0.53	X	0.8	=	4.81	(80)
` `				$\overline{}$	for each m		_	70 70 1 40 70 7		$\overline{}$	um(74)m .		T 00 ==	0.00	1	(00)
(83)m=	29.47	57.65	94.9			9.71		73.72 165.39 33)m , watts	142	2.07	110.43	68.41	36.75	24.24]	(83)
Ţ	309.97	336.65	365.8	_	` 	4.97	·	06.42 389.71	370	07	345.49	316.5	3 299.85	298.21	1	(84)
` ' L				_			_	30.72 303.71	3/1	J. 1	J-J.+3	010.0	299.00	230.21]	(• 1)
					heating se			one of the T	LI- ↑	.	4 (00)					7(05)
•		_		•			-	area from Ta	e 9ia	, in	i (°C)				21	(85)
Utilisat F		Ť		$\overline{}$			È	ee Table 9a)			Co	0-1	Mari	Das	1	
(86)m=	Jan 0.99	Feb 0.98	0.96	\rightarrow		May .73	_	Jun Jul 0.53 0.38	0.4	ug 42	Sep 0.66	Oct 0.91	0.98	0.99	4	(86)
L								!	1		ļ	0.91	0.90	0.33]	(00)
Г				-			$\overline{}$	w steps 3 to		-		00.00	1 00 50	00.00	1	(07)
(87)m=	20.28	20.4	20.6)	20.83 20	0.96		21 21	1 2	:1	20.98	20.82	20.52	20.26]	(87)

T		al				al a III a a	f T.	bla O. T	LO (0 0)					
(88)m=	20.16	20.16	neating p	20.18	20.18	20.19	20.19	20.2	n2 (°C) 20.19	20.18	20.18	20.17		(88)
. ,		L	ains for						20.19	20.16	20.16	20.17		(00)
(89)m=	0.99	0.98	0.95	0.86	0.68	0.47	0.31	0.35	0.59	0.88	0.97	0.99		(89)
Mean	interna	l tempei	rature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 1	r 7 in Tabl	e 9c)				
(90)m=	19.22	19.39	19.67	19.99	20.14	20.19	20.19	20.2	20.18	19.99	19.57	19.2		(90)
		1							f	LA = Livin	g area ÷ (4	1) =	0.69	(91)
Mean	interna	ıl tempeı	rature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2			•		
(92)m=	19.96	20.09	20.31	20.57	20.71	20.75	20.75	20.75	20.74	20.56	20.23	19.94		(92)
Apply	adjustr	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.96	20.09	20.31	20.57	20.71	20.75	20.75	20.75	20.74	20.56	20.23	19.94		(93)
			uirement											
			ternal ter or gains			ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.99	0.98	0.95	0.87	0.72	0.51	0.36	0.4	0.64	0.9	0.97	0.99		(94)
			, W = (9	<u> </u>										(05)
(95)m=	306.05	329.25	347.88	345.25	296.86	207.74	141.19	147.4	221.49	283.62	291.98	295.11		(95)
(96)m=	4.3	4.9	ernal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern											, ,
(97)m=	556.33		487.64	405.22	311.73	209.27	141.34	147.66	227.35	344.89	457.5	551.93		(97)
Space	e heatin	g requir	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻)m			
(98)m=	186.21	140.29	103.98	43.18	11.06	0	0	0	0	45.58	119.17	191.07		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	840.55	(98)
Space	e heatin	g requir	ement in	kWh/m²	?/year								21.44	(99)
9b. En	ergy red	quireme	nts – Cor	nmunity	heating	scheme								
			oace hea from se								unity sch	neme.	0	(301)
	-		from co	-		-	_	1 45.0	., •	0110		[]	1	(302)
	•			•	•	`	,	allows for	CUD and	un to four	other heat	nouroon: th		(002)
			y obtain he s, geotherr							ир то тоит с	Jillel Heat	sources, u	ie iallei	
Fractio	n of hea	at from (Commun	ity heat	pump								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for o	commun	ity heatii	ng syste	m				Ī	1.25	(306)
Space	heatin	g										•	kWh/ye	ear
Annua	l space	heating	requiren	nent									840.55	
Space	heat fro	om Com	munity h	eat pum	р				(98) x (30	04a) x (305	5) x (306) =	= [1050.69	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
												-		•

Space heating requirement from secondary/supplementary	y system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		1686.6]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2108.25	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	31.59	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter	er 0) = (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	from outside	114.36	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	114.36	(331)
Energy for lighting (calculated in Appendix L)		188.22	(332)
Electricity generated by PVs (Appendix M) (negative quant	tity)	-255.24	(333)
Electricity generated by wind turbine (Appendix M) (negative	ve quantity)	0	(334)
12b. CO2 Emissions – Community heating scheme	Energy Emission factor kWh/year kg CO2/kWh		
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%)		kg CO2/year	7 _(367a)
Efficiency of heat source 1 (%)	P using two fuels repeat (363) to (366) for the second fue	319	(367a)
Efficiency of heat source 1 (%)	P using two fuels repeat (363) to (366) for the second fuels (367b) + (310b)] x 100 ÷ (367b) x	319	(367a) (367) (372)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 [(3)	(363) to (366) for the second fuels repeat (363) to (366) for the second fuels (375)+(310b)] x 100 ÷ (367b) x 0.52	el 319 = 513.95	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	HP) P using two fuels repeat (363) to (366) for the second fuels (367b) + (310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(372)	513.95 = 16.39	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	(363)(366) + (368)(372)	513.95 = 513.95 = 16.39 = 530.34	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	(363)(366) + (368)(372)	319 = 513.95 = 16.39 = 530.34 = 0	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant	(363)(366) + (368)(372) (309) x (373) + (374) + (375) =	319 = 513.95 = 16.39 = 530.34 = 0](367)](372)](373)](374)](375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantal Total CO2 associated with space and water heating	(363)(366) + (368)(372) (309) x (373) + (374) + (375) = (364) (365) (366) for the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of the second fuel of	319 = 513.95 = 16.39 = 530.34 = 0 = 0](367)](372)](373)](374)](375)](376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within constant to the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of the constant of	(363)(366) + (368)(372) (309) x (373) + (374) + (375) = (332))) x (369) x (309) x	319 = 513.95 = 16.39 = 530.34 = 0 = 0 = 530.34 = 59.35](367)](372)](373)](374)](375)](376)](378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control o	(363)(366) + (368)(372) (309) x (373) + (374) + (375) = (332))) x (363) (363) (363)(366) = (368)(372) (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (374) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (3	319 513.95 16.39 530.34 0 530.34 593.5 97.68	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within of CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as as litem 1	(363)(366) + (368)(372) (309) x (373) + (374) + (375) = (332))) x (363) (363) (363)(366) = (368)(372) (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (373) + (374) + (375) = (374) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (374) + (375) = (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (375) + (3	319 513.95 16.39 530.34 0 530.34 59.35 97.68	(367) (372) (373) (374) (375) (376) (378) (379)

		User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Versic	on: 1.0.4.26	
		Property	Address:	C114_	Be Gree	n			
Address :	The Charlie Ratchford Cer	tre, Belm	ont Stree	et, LONI	DON, NV	V1 8HF			
1. Overall dwelling dime	nsions:								
0			a(m²)			ight(m)	٦,_ ,	Volume(m³)	_
Ground floor			39.2	(1a) x	2	2.8	(2a) =	109.76	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	39.2	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	(3n) =	109.76	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0	= [0	X ·	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x	20 =	0	(6b)
Number of intermittent far	ns				2	x	10 =	20	(7a)
Number of passive vents				Ī	0	×	10 =	0	(7b)
Number of flueless gas fin	res			Ī	0	X ·	40 =	0	(7c)
				_					
						<u> </u>	Air ch	nanges per ho	ur
	/s, flues and fans = $(6a)+(6b)+$				20		÷ (5) =	0.18	(8)
If a pressurisation test has be Number of storeys in the	een carried out or is intended, proce	eed to (17),	otherwise o	continue fr	rom (9) to ((16)		0	(9)
Additional infiltration	ie dweiling (115)					[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame of	or 0.35 fo	r masonr	y consti	ruction	1(0)	.,	0	(11)
	esent, use the value corresponding			•				-	`
deducting areas of opening	· · ·	0.1 (000)	ممار مامم	antar O				_	7,,0
If no draught lobby, ent	loor, enter 0.2 (unsealed) or	u. i (seale	ea), eise	enter 0				0	(12)
• • • • • • • • • • • • • • • • • • • •	s and doors draught stripped							0	(13)
Window infiltration	and doors draught stripped		0.25 - [0.2	x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	· · · · + (11) + ('	- 12) + (13) -	+ (15) =		0	(16)
	q50, expressed in cubic met	res per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20]$	+(8), otherw	rise (18) = (16)		·		0.43	(18)
Air permeability value applies	s if a pressurisation test has been d	one or a de	gree air pei	meability	is being u	sed			_
Number of sides sheltere	d		(20) 4	0 07F (4	10\1			2	(19)
Shelter factor	San alia Mara Caratan		(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorporat	-		(21) = (18)	(20) =				0.37	(21)
Infiltration rate modified for		1	1 0	Can	0.4	Nov	Daa	1	
l l	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind specification (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	4.5 4.4 4.5 3.8	3.8	3.1	4	4.3	4.0	4.1	l	
Wind Factor (22a)m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m =	2)m ÷ 4							_	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.47	0.46	0.45	0.4	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
Calculate effe		•	rate for t	he appli	cable ca	se	ļ		ļ.	<u>. </u>	ļ	<u> </u>	
If mechanica												0	(23
If exhaust air h) = (23a)			0	(23
If balanced with		-	-	_								0	(23
a) If balance		i				, ``	- ^ `-	ŕ	 	` 	1 ` ´	÷ 100] I	(0.
24a)m= 0	0	0	0	0	0	0 (1	0	0	0	0	0		(24
b) If balance	ea mech	anicai ve	entilation 0	without	neat red	covery (i	0 (240	0)m = (22)	2b)m + (23b) ₀	0	1	(24
	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>			0		(2-
c) If whole h				•	o); other				.5 × (23b	o)			
$\frac{(225)!}{(4c)m} = 0$	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	L ventilatio	n or wh	ole hous	L nositiv	ve input	L ventilatio	n from I	oft.	<u> </u>	<u>ļ</u>		J	
					erwise (2				0.5]				
24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)	-		-		
25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(2
3. Heat losse	e and he	at lose i	naramet	or.					_		_		
LEMENT	Gros		Openin		Net Ar	rea	U-vali	IE.	ΑXU		k-value	a a	AXk
	area		m		A ,r		W/m2		(W/	K)	kJ/m ² ·l		kJ/K
oors Type 1					2.5	х	1.2	= [3				(2
oo <mark>rs Type 2</mark>					2.5	X.	1.2	_ = [3				(2
Vindows Type	1				2.46	x1.	/[1/(1.4)+	0.04] =	3.26				(2
Vindows Type	2				1.56	x1.	/[1/(1.4)+	0.04] =	2.07	-			(2
Vindows Type	e 3				0.78	x1.	/[1/(1.4)+	0.04] =	1.03				(27
Valls	29.1	2	9.8		19.32	2 x	0.18	i	3.48				(29
Roof	39.:	2	0	=	39.2	x	0.13	= i	5.1	F i		7 F	(30
otal area of e	lements	, m²			68.32	2							(3
for windows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcui	 lated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	n paragraph	3.2	
* include the area	as on both	sides of in	nternal wal	ls and par	titions								
abric heat los		•	U)				(26)(30)	+ (32) =				20.94	(3
eat capacity		,						((28)	(30) + (3	2) + (32a)	(32e) =	0	(3
hermal mass	•	•		,					tive Value			250	(3
or design asses: an be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge				usina Ar	pendix l	K						3.42	(3
details of therma	•	,		•	•							3.42	(
otal fabric he			, ,	,	,			(33) +	(36) =			24.35	(3
entilation hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 ×	(25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
88)m= 22.08	21.93	21.78	21.07	20.94	20.32	20.32	20.2	20.55	20.94	21.2	21.49		(3
eat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m			
eat transfer of 46.44	defficier 46.28	nt, W/K 46.13	45.42	45.29	44.67	44.67	44.56	(39)m 44.91	= (37) + (45.29	38)m 45.56	45.84		

Heat loss parar	matar (k	JI D) \//	m2k					(40)m	= (39)m ÷	- (4)			
(40)m= 1.18	1.18	1.18	1.16	1.16	1.14	1.14	1.14	1.15	1.16	1.16	1.17		
(40)111= 1.10	1.10	1.10	1.10	1.10	1.14	1.14	1.14			Sum(40) ₁ .		1.16	(40)
Number of days	s in moi	nth (Tab	le 1a)					,	Average =	3um(40)1.	12 / 12=	1.10	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		l				<u> </u>			<u> </u>	!			
4 184 4 1 4											1.50//./		
4. Water heati	ng enei	rgy requi	rement:								kWh/ye	ear:	
Assumed occup if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		39		(42)
Annual average Reduce the annual not more that 125 I	l average	hot water	usage by	5% if the a	welling is	designed t			se target o		7.1		(43)
					_		۸۰۰۰	Con	Oct	Nov	Doo		
Jan Hot water usage in	Feb	Mar day for ea	Apr	May $Vd.m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
							, ,	05.70	CO 44	74.40	70.04		
(44)m= 73.81	71.13	68.44	65.76	63.07	60.39	60.39	63.07	65.76	68.44	71.13	73.81	005.40	— (44)
Energy content of I	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600			ım(44) ₁₁₂ = ables 1b, 1		805.19	(44)
(45)m= 109.46	95.73	98.79	86.12	82.64	71.31	66.08	75.83	76.73	89.43	97.61	106		
(10)= 100.10	00.10	00.10	00.12	02.01	11.01	00.00	70.00			ım(45) ₁₁₂ =		1055.74	(45)
If inst <mark>antane</mark> ous wa	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotal – ou	11(10)112		1000.7 1	(
(46)m= 16.42	14.36	14.82	12.92	12.4	10.7	9.91	11.37	11.51	13.41	14.64	15.9		(46)
Water storage		, , ,		. \	0.44 JD.O								
Storage volume	,							ame ves	sel		150		(47)
If community he	_			_					(01 ! /	(47)			
Otherwise if no		not wate	er (tnis in	iciuaes i	nstantar	neous co	iloa iami	ers) ente	er o in ((47)			
Water storage I a) If manufactu		aclared l	nee facto	nr is kna	wn (k\//k	u/dav/).					20		(48)
•) 13 KHO	WII (ICVVI	i/day).					39		
Temperature fa							(40) (40)				54		(49)
Energy lost fror b) If manufactu		_	-		or is not		(48) x (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community he	-			`		,							. ,
Volume factor f	rom Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fror	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (5	54) in (5	55)								0.	75		(55)
Water storage I	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (<u>I</u> H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3		-		-	-		0		(58)
Primary circuit	loss cal	culated t	or each	month (•	. ,	, ,					ı	
(modified by	factor f	rom Tab	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)		1	
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combiles o	الم ماده المادة	for oo ale		(C1)	(00) . 20	CE (44)	١						
Combi loss c	alculated 0	for each	month	$\frac{(61)m}{0}$	(60) ÷ 30	05 × (41))m 0	T 0	0	Ιο	0	1	(61)
		<u> </u>	<u> </u>							<u> </u>		(E0)m + (61)m	(01)
(62)m= 156.05	.	145.38	131.22	129.23	116.4	112.67	122.42		136.02	142.71	152.6	· (59)m + (61)m]	(62)
Solar DHW inpu				<u> </u>						ļ		1	(02)
(add addition									. contribu	ion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from v	water hea	ter		ļ.		!	<u>. </u>			!		1	
(64)m= 156.05	_	145.38	131.22	129.23	116.4	112.67	122.42	121.83	136.02	142.71	152.6]	
	•			Į.			Ou	tput from w	ater heate	r (annual) ₁	12	1604.35	(64)
Heat gains from	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	١]	
(65)m= 73.67	65.5	70.12	64.71	64.75	59.78	59.25	62.49	61.59	67.01	68.53	72.52		(65)
include (57)m in calc	culation	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a):									
Metabolic gai	ns (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26	69.26		(66)
Ligh <mark>ting g</mark> ains	s (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 11.31	10.05	8.17	6.19	4.62	3.9	4.22	5.48	7.36	9.34	10.91	11.63		(67)
App <mark>liance</mark> s g	ains (ca <mark>lc</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble <mark>5</mark>				
(68)m= 119.53	120.77	117.64	110.99	102.59	94.69	89.42	88.18	91.31	97.96	106.36	114.25		(68)
Coo <mark>king g</mark> ain	s (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5				
(69)m= 29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93	29.93		(69)
Pumps and fa	ans gains	(Table 5	5a)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)			_				-	
(71)m= -55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41	-55.41]	(71)
Water heating		able 5)	•									-	
(72)m= 99.02	97.47	94.25	89.87	87.03	83.03	79.63	83.99	85.54	90.07	95.18	97.48]	(72)
Total interna	-		·)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)		1	
(73)m= 276.64		266.84	253.83	241.02	228.41	220.05	224.43	230.98	244.15	259.22	270.13]	(73)
6. Solar gair				T. I. I. O.							,.		
Solar gains are		•				•	itions to d		ie applicai	ole orientat	tion.	Coina	
Orientation:	Table 6d		Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	Т	able 6c		Gains (W)	
East 0.9x	0.3	x	0.7	70	x 1	19.64	1 x [0.63	x	0.7		1.82	(76)
East 0.9x		^ ^	0.7			38.42	」^ <u>∟</u>] _×	0.63	╣ ,	0.7	=	3.57](76)](76)
East 0.9x		^ ^	0.7			63.27	」^ <u>∟</u>]	0.63	^	0.7	-	5.88](76)
East 0.9x		x	0.7			92.28	」^ <u>∟</u>]	0.63	^	0.7	-	8.57](76)](76)
East 0.9x		x	0.7	==	-	13.09] ^ <u> </u>] _× [0.63	^ x	0.7	_ =	10.5](76)](76)
. U.U.	0.3	^ ^	U.1		··'	10.03	ı ^ L	0.03	^ L	0.1		10.5	J (. °)

East	0.0				2	_	, —	445.77	1		0.00	٦		\neg	10 ==	(70)
East	0.9x	0.3		X	0.78	=	×	115.77] X		0.63	X	0.7	_ =	10.75	(76)
East	0.9x	0.3		Χ	0.78	=	×	110.22] X]		0.63	X	0.7	_ =	10.24	(76)
East	0.9x	0.3		Χ	0.78	=	×	94.68] X]		0.63	X 	0.7	ᆗ ⁼	8.79	(76)
East	0.9x	0.3		X	0.78	=	×	73.59] X]		0.63	X 	0.7	=	6.83	(76)
	0.9x	0.3		X	0.78	=	×	45.59	」 X ¬		0.63	×	0.7	_ =	4.23	(76)
East	0.9x	0.3		X	0.78	=	×	24.49	」 X ¬		0.63	X	0.7	╡ -	2.27	(76)
East	0.9x	0.3		X	0.78	╡	×	16.15	」 X ¬		0.63	」 ×	0.7	=	1.5	(76)
West	0.9x	0.77		X	2.46	╡	×	19.64	」 X ¬		0.63	×	0.7	=	14.77	(80)
West	0.9x	0.3		X	1.56	╡	×	19.64	」 X ¬		0.63	×	0.7	=	3.65	(80)
West	0.9x	0.77		X	2.46	╡	×	38.42	」 X ¬		0.63	×	0.7	=	28.88	(80)
West	0.9x	0.3		X	1.56	_	×	38.42	X		0.63	X	0.7	_ =	7.14	(80)
West	0.9x	0.77		X	2.46	_ :	×	63.27	X		0.63	X	0.7	=	47.57	(80)
West	0.9x	0.3		X	1.56		×	63.27	X		0.63	X	0.7	=	11.75	(80)
West	0.9x	0.77		X	2.46		x	92.28	X		0.63	X	0.7	=	69.38	(80)
West	0.9x	0.3		X	1.56	:	×	92.28	X		0.63	X	0.7	=	17.14	(80)
West	0.9x	0.77		X	2.46		x	113.09	X		0.63	X	0.7	=	85.02	(80)
West	0.9x	0.3		X	1.56		x	113.09	X		0.63	X	0.7	=	21.01	(80)
West	0.9x	0.77		X	2.46		× \square	115.77	X		0.63	X	0.7	=	87.04	(80)
West	0.9x	0.3		x	1.56	3	x	115.77] x		0.63	x	0.7		21.5	(80)
West	0.9x	0.77		x	2.46		x	110.22] x		0.63	x	0.7	=	82.86	(80)
West	0.9x	0.3		x	1.56		× \square	110.22] x		0.63	x	0.7	=	20.47	(80)
West	0.9x	0.77		x	2.46		x	94.68	Х		0.63	x	0.7	=	71.18	(80)
West	0.9x	0.3		x	1.56		x	94.68	X		0.63	x	0.7	=	17.59	(80)
West	0.9x	0.77		x	2.46		x 🔼	73.59	X		0.63	x	0.7	=	55.32	(80)
West	0.9x	0.3		X	1.56		x	73.59	x		0.63	x	0.7	=	13.67	(80)
West	0.9x	0.77		x	2.46		x $\overline{}$	45.59	x		0.63	x	0.7	=	34.27	(80)
West	0.9x	0.3		x	1.56		x	45.59	X		0.63	×	0.7	=	8.47	(80)
West	0.9x	0.77		x	2.46	$\overline{}$	x 🔚	24.49	X		0.63	x	0.7	_ =	18.41	(80)
West	0.9x	0.3		x	1.56	=	x =	24.49	X		0.63	x	0.7	_ =	4.55	(80)
West	0.9x	0.77		x	2.46	-	x =	16.15	X		0.63	x	0.7	=	12.14	(80)
West	0.9x	0.3		x	1.56	_	x =	16.15	x		0.63	×	0.7		3	(80)
	_								_							
Solar g	gains in	watts, ca	alcula	ted	for each m	onth			(83)m	n = Su	ım(74)m	.(82)m			_	
(83)m=	20.24	39.59	65.2	2	95.09 11	6.53	119.2	9 113.57	97.	56	75.83	46.98	25.23	16.64		(83)
Total g	ains – ir	nternal a	nd so	olar	(84)m = (73)	3)m +	(83)	m , watts							-	
(84)m=	296.87	314.65	332.	04	348.92 35	7.56	347.	7 333.62	321	.99	306.81	291.13	3 284.46	286.78		(84)
7. Me	an inter	nal temp	eratu	ıre (heating sea	ason)										
Temp	erature	during h	eatin	g pe	eriods in the	e livin	g are	a from Tal	ble 9	, Th1	l (°C)				21	(85)
Utilisa	ation fac	tor for g	ains f	or li	ving area, l	<u>1,m</u>	(see	Table 9a)							_	
	Jan	Feb	Ma	ar	Apr I	Лау	Jur	n Jul	А	ug	Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.99	0.98	8	0.96 0	.89	0.74	0.57	0.6	61	0.84	0.96	0.99	1]	(86)
Mean	interna	l temper	ature	in li	ving area	1 (fo	llow s	steps 3 to 7	7 in 7	able	9c)					
(87)m=	19.86	19.97	20.1).76	20.93	i	20.		20.87	20.54	20.16	19.84]	(87)
					<u>l</u>	!			-	!				•	•	

-					, -							
Temperature d		.	1		1	1	· · ·	40.00	40.05	10.04		(00)
(88)m= 19.93	19.94 19.94	19.95	19.96	19.97	19.97	19.97	19.96	19.96	19.95	19.94		(88)
Utilisation factor	<u>_</u>	1		· `	1			<u> </u>	<u> </u>		1	(22)
(89)m= 0.99	0.99 0.98	0.94	0.85	0.65	0.45	0.49	0.76	0.95	0.99	0.99		(89)
Mean internal	temperature in	the rest	of dwelli	ing T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)	•		ı	
(90)m= 18.43	18.59 18.91	19.35	19.71	19.92	19.96	19.96	19.86	19.44	18.88	18.42		(90)
							f	fLA = Livin	g area ÷ (4	4) =	0.69	(91)
Mean internal	temperature (f	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 19.42	19.55 19.79	20.14	20.44	20.63	20.67	20.67	20.56	20.21	19.77	19.41		(92)
Apply adjustme	ent to the mea	n interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 19.42	19.55 19.79	20.14	20.44	20.63	20.67	20.67	20.56	20.21	19.77	19.41		(93)
8. Space heati	ng requiremen	nt										
Set Ti to the m the utilisation f		•		ned at sto	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor	or for gains, hr	n:		•	•		•			•	l	
(94)m = 0.99	0.99 0.98	0.95	0.87	0.71	0.53	0.57	0.81	0.95	0.98	0.99		(94)
Us <mark>efu</mark> l gains, h	mGm , W = (9	94)m x (8	4)m									
(95)m= 294.35	310.75 324.46	330.53	312.06	248.06	178	184.59	248.69	276.97	280.15	284.7		(95)
Monthly averag	ge ex <mark>terna</mark> l ter	nperature	from Ta	able 8								
(96)m= 4.3	4.9 6 .5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate			_	Lm , W =		, , ,	– (96)m]				
` '	677.91 613.25		395.69	269.15	181.94	190.21	290.31	435	577.14	697.05		(97)
Space heating				Wh/mon	th = 0.02	24 x [(97)m – (95					
(98)m= 303.37	246.73 214.85	129.54	62.22	0	0	0	0	117.58	213.83	306.78		_
						Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1594.9	(98)
Space heating	requirement in	n kWh/m²	²/year								40.69	(99)
9a. Energy requ		dividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating	•	naandar	v/oupplo	montory	, avatam					ı	0	(201)
Fraction of spa				ineniary	•		(204)				0	 ` ` `
Fraction of spa		•	` '			(202) = 1	` '				1	(202)
Fraction of total	al heating from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of m	ain space hea	ting syste	em 1								93.5	(206)
Efficiency of se	econdary/supp	lementar	y heatin	g systen	า, %						0	(208)
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space heating	requirement (calculate	d above)		•						
303.37	246.73 214.85	129.54	62.22	0	0	0	0	117.58	213.83	306.78		
(211) m = {[(98)r	n x (204)] } x	100 ÷ (20	06)									(211)
324.46	263.88 229.79	138.54	66.55	0	0	0	0	125.75	228.69	328.11		
	•	•		•	•	Tota	l (kWh/yea	ar) =Sum(2	211),,,,5,10,12	<u></u>	1705.77	(211)
Space heating	fuel (seconda	ry), kWh/	month									
= {[(98)m x (201)] } x 100 ÷ (20	08)										
(215)m= 0	0 0	0	0	0	0	0	0	0	0	0		
						Tota	l (kWh/yea	or) -Sum/	04.5\	_		(215)
						1018	ıı (KVVII/yea	ar) =Surri(2	213) _{15,1012}	-	0	(215)

Water heating								
Output from water heater (calculated above) 156.05 137.82 145.38 131.22 129.23 1	16.4 112.67	122.42	121.83	136.02	142.71	152.6		
Efficiency of water heater			<u> </u>	l			79.8	(216)
(217)m= 86.56 86.35 85.85 84.78 82.99 7	79.8 79.8	79.8	79.8	84.43	85.89	86.64		(217)
Fuel for water heating, kWh/month	-						•	
(219) m = (64) m x $100 \div (217)$ m (219)m = 180.29 159.6 169.34 154.77 155.72 14	45.87 141.2	153.41	152.66	161.11	166.15	176.13		
		Tota	I = Sum(2				1916.25	(219)
Annual totals				k\	Wh/year	•	kWh/year	
Space heating fuel used, main system 1							1705.77	
Water heating fuel used							1916.25	7
Electricity for pumps, fans and electric keep-hot						•		_
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							199.78	(232)
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHP)					
	Energy kWh/ye <mark>ar</mark>			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Spa <mark>ce he</mark> ating (main system 1)	(211) x			0.2	16	=	368.45	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	413.91	(264)
Space and water heating	(261) + (262)	+ (263) + ((264) =				782.36	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	103.68	(268)
				L				_
Total CO2, kg/year			sum o	of (265)(2	271) =		924.97	(272)

TER =

(273)

34.57

		User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Vorsio	on: 1.0.4.26	
Software Name.		Property	Address:				VEISIC	71. 1.0.4.20	
Address :	The Charlie Ratchford Cent					V1 8HF			
1. Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m³)
Ground floor			75.5	(1a) x	2	2.8	(2a) =	211.4	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	75.5	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	(3n) =	211.4	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	7 + [0	=	0	x 2	20 =	0	(6b)
Number of intermittent far	ns			Ī	0	x -	10 =	0	(7a)
Number of passive vents				Ē	0	x -	10 =	0	(7b)
Number of flueless gas fir	res			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges <mark>per</mark> ho	ur
Infilt <mark>ration</mark> due to chi <mark>mne</mark> y	ys, flues and fans = $(6a)+(6b)+($	7a)+(7b)+((7c) =		0		÷ (5) =	0	(8)
	een ca <mark>rried o</mark> ut or is intended, procee	ed to (17),	otherwise c	ontinue fr	om (9) to ((16)			_
Number of storeys in the Additional infiltration	ie dweiling (ns)					[(0)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 fo	r masonr	v constr	ruction	[(9)]	-1]XU.1 =	0	(11)
	resent, use the value corresponding t			•	dollori			<u> </u>	(\.,
deducting areas of opening	· · ·	\	1\ -1						¬
If suspended wooden in	loor, enter 0.2 (unsealed) or 0).1 (seale	ea), eise	enter U				0	(12)
• • • • • • • • • • • • • • • • • • • •	s and doors draught stripped							0	(13)
Window infiltration	, and doors araagin suipped		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per ho	our per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	ity value, then $(18) = [(17) \div 20] + (18)$	(8), otherw	rise (18) = (16)				0.15	(18)
	s if a pressurisation test has been do	ne or a de	gree air per	meability	is being u	sed		Г	¬
Number of sides sheltere Shelter factor	a		(20) = 1 - [0.075 x (1	19)] =			0.85	(19)
Infiltration rate incorporat	ing shelter factor		(21) = (18)		, .			0.03	(21)
Infiltration rate modified for			, , , ,	` '				0.13	(,
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 . 1						1	ı	
 	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Foster (00-) (00	2)						•	•	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18]	
(220)111- 1.21 1.20	1.20 1.1 1.00 0.95	0.95	0.82	ı	1.00	1.12	1.10	J	

0.16	ation rate (al		0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe		•	the appli	cable ca	ise	<u>. </u>		ļ	ļ	Į.		
	al ventilation:										0.5	(2
	eat pump using) = (23a)			0.5	(2
	n heat recovery:										76.5	(2
· —	ed mechanica		1		- 	- ^ ` ` 	ŕ	– `		``	÷ 100]	
4a)m= 0.28	0.28 0.2		0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
· —	ed mechanica		1	1	, , , ,	- ^ ` ` - 	í `	 		1	ı	
4b)m= 0	0 (0	0	0	0	0	0	0	0		(2
,	ouse extract n < 0.5 × (23		•	•				5 × (23b)			
4c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(:
,	ventilation or n = 1, then (2							0.5]				
4d)m= 0	0 (0	0	0	0	0	0	0	0	0		(
Effective air	change rate	- enter (24a	a) or (24l	o) or (24	c) or (24	d) in bo	x (25)					
5)m= 0.28	0.28 0.2	27 0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(
Heat losse	s and heat lo	oss naramet	er.									-
EMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		A X k kJ/K
oors				2.4	x	1.3	= [3.12				(
in <mark>dows</mark> Type) 1			2.4	x1	/[1/(1.3)+	- 0.04] =	2.97				(
indows Type	2			2.6	x1	/[1/(1.3)+	-0.04] =	3.21	П			(
indows Type	3			2.6	x1	/[1/(1.3)+	- 0.04] =	3.21	٦			(
indows Type	. 4			2.6	<u>x</u> 1	/[1/(1.3)+	- 0.04] =	3.21				(
indows Type	e 5			2.6	x1	/[1/(1.3)+	- 0.04] =	3.21	=			(
indows Type	e 6			2.6	x1	/[1/(1.3)+	- 0.04] =	3.21	=			(
alls Type1	60.48	28.:	2	32.28	3 x	0.15	i	4.84	= [(
alls Type2	20.16	0		20.16	5 x	0.14	=	2.85	=			(
oof	75.5			75.5	x	0.1	≓ ₌¦	7.55	=		7 =	(
otal area of e	elements, m ²			156.1	=							` (
	roof windows, ι		indow U-va			g formula 1	1/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	3.2	•
include the area	as on both sides	of internal wa	lls and par	titions								
bric heat los	ss, $W/K = S$ (,				(26)(30) + (32) =				50.25	(
	Cm = S(A x A x)	•					((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
eat capacity		TMD 0	· TEA\ ir	า kJ/m²K	, L		Indica	tive Value	Medium		250	(
eat capacity nermal mass	parameter (•									
eat capacity nermal mass r design assess n be used inste	sments where that ad of a detailed	ne details of the calculation.	e construct			recisely the	e indicative	values of	TMP in Ta	able 1f		
eat capacity nermal mass or design assess n be used inste	sments where th	ne details of the calculation.	e construct			recisely the	e indicative	values of	TMP in Ta	able 1f	7.78	(

Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Separation Sep	Ventila	tion hea	at loss ca	alculated	l monthly	У				(38)m	= 0.33 × (25)m x (5))		
Heat transfer coefficient, W/K (38)ms 77.56 77.34 77.12 76.01 75.79 74.67 74.67 74.67 74.57 75.79 76.23 76.28 76.88 Heat loss parameter (HLP), W/m²/K Heat loss parameter		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Company Comp	(38)m=	19.54	19.32	19.09	17.98	17.76	16.65	16.65	16.42	17.09	17.76	18.2	18.65		(38)
Heat loss parameter (HLP), W/m²K (40)m= 1.03 1.02 1.02 1.01 1 0.99 0.99 0.99 0.99 1 1 1.01 1.0	Heat tr	ansfer o	coefficier	nt, W/K					•	(39)m	= (37) + (37)	38)m			
Heat loss parameter (HLP), W/m²K	(39)m=	77.56	77.34	77.12	76.01	75.79	74.67	74.67	74.45	75.12	75.79	76.23	76.68		
Average Sum(40) Lip / 12 = 1.01 (40)	Heat Id	ss para	meter (H	HLP), W/	′m²K								12 /12=	75.95	(39)
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(40)m=	1.03	1.02	1.02	1.01	1	0.99	0.99	0.99	0.99	1	1.01	1.02		
4. Water heating energy requirement: Assumed occupancy, N	Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.01	(40)
### A. Water heating energy requirement: ### A. Saumed occupancy, N ### TFA & 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) ### TFA & 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) ### A. Dr. A. Saumed occupancy, N ### TFA & 13.9, N = 1 ### A. Dr. A. Saumed occupancy, N ### TFA & 13.9, N = 1 ### A. Dr. A. Saumed occupancy, N ### TFA & 13.9, N = 1 ### A. Dr. A. Saumed occupancy, N ### A. Dr. A. Saumed occupancy, N ### A. Dr. A. Saumed occupancy, N ### A. Dr. A. Dr. A. Saumed occupancy ### A. Dr. A. Dr. A. Saumed occupancy ### A. Dr. A. Dr. A. Saumed occupancy ### A. Dr. A. Dr. A. Saumed occupancy ### A. Dr. A. Saumed occupancy ### A. Dr. A. Saumed occupancy ### A. Dr. A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Saumed occupancy ### A. Sau		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 126 litres per clay litres per day IV and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (45) (44)m= 99.59 96.97 92.34 88.72 85.1 81.48 81.48 85.1 88.72 92.34 95.97 99.59 Total = Sum(44)= 1096.4 Lenergy content of hot water used - calculated monthly = 4.190 x Vd,m k mm x DTm / 3600 kWh/month (see Tables 1b. 1c, 1d) Total = Sum(44)= 1096.4 It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) Utherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.63 (48) Temperature factor from Table 2b (50) Energy lost from water storage, kWh/year (48) x (49) = 0.98 (50) D) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56)	(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 126 litres per clay litres per day IV and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (45) (44)m= 99.59 96.97 92.34 88.72 85.1 81.48 81.48 85.1 88.72 92.34 95.97 99.59 Total = Sum(44)= 1096.4 Lenergy content of hot water used - calculated monthly = 4.190 x Vd,m k mm x DTm / 3600 kWh/month (see Tables 1b. 1c, 1d) Total = Sum(44)= 1096.4 It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) Utherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.63 (48) Temperature factor from Table 2b (50) Energy lost from water storage, kWh/year (48) x (49) = 0.98 (50) D) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56)															
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd.average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (45) (44)n= 99.59 95.97 92.34 88.72 85.1 81.48 81.48 85.1 88.72 92.34 95.97 99.59 Total = Sum(44): = 1086.4 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm 7.3600 kW/hrooth (see Tables 1b, 1c, 1d) (45)n= 147.68 129.17 133.29 116.2 111.5 96.22 89.16 102.31 103.53 120.66 131.71 143.02 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) Water storage loss: Storage Volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.63 (48) Temperature factor from Table 2b 0.6 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.98 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (56) Energy lost from water storage, kWh/year (55) x (41)m	4. Wa	iter heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1	Assum	ed occu	ıpancv. İ	N								2	37		(42)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43) [44]m= 99.59 95.97 92.34 88.72 85.1 81.48 81.48 85.1 88.72 92.34 95.97 99.59 Total = Sum(44) = 1086.4 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm 73600 kWh/month (see Tables 1b, 1c, 1d) [45]m= 147.68 129.47 133.29 116.2 111.5 96.22 89.16 102.31 103.53 120.66 131.71 143.02 Total = Sum(45) = 1424.45 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.63 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.98 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)	if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		.51		(12)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec).53		(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec								-	to achieve	a water us	se target o	Ť			
Hot water usage in litres per day for each month Vd.m.= factor from Table 1c x (43) (44)m= 99.59 95.97 92.34 88.72 85.1 81.48 81.48 85.1 88.72 92.34 95.97 99.59 Total = Sum(44)v = 1086.4 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 147.68 129.17 133.29 116.2 111.5 96.22 89./6 102.31 103.53 120.66 131.71 143.02 Total = Sum(45)v = 1424.45 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 22.15 19.37 19.99 17.43 16.72 14.43 13.37 15.35 15.53 18.1 19.76 21.45 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.63 (48) Energy lost from water storage, kWh/year (48) x (49) = 0.98 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)									Aug	Sen	Oct	Nov	Dec		
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Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm7 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m=	(44)m=	99.59	95.97	92.34	88.72	85.1	81.48	81.48	85.1	88.72	92.34	95.97	99.59		
Total = Sum(45)u = 1424.45 (45)	Energy (content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600					1086.4	(44)
### Instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) ### (46)m= 22.15 19.37 19.99 17.43 16.72 14.43 13.37 15.35 15.53 18.1 19.76 21.45 ### Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) ### If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) ### Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day):	(45)m=	147.68	129.17	133.29	116.2	111.5	96.22	89.16	102.31	103.53	120.66	131.71	143.02		
(46)me 22.15 19.37 19.99 17.43 16.72 14.43 13.37 15.35 15.53 18.1 19.76 21.45 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.63 (48) Temperature factor from Table 2b 0.6 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.98 (50) Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)											Γotal = Su	m(45) ₁₁₂ =	=	1424.45	(45)
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) o (51) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = O (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) × (41)m	If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)		_			_
Storage volume (litres) including any solar or WWHRS storage within same vessel If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) f) community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year C(52) Temperature factor from Table 2b Energy lost from water storage, kWh/year C(52) Energy lost from water storage, kWh/year C(53) Energy lost from water storage, kWh/year C(54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) × (41)m	. ,			19.99	17.43	16.72	14.43	13.37	15.35	15.53	18.1	19.76	21.45		(46)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) × (41)m		•		includin	na anv eo	olar or M	/\//HRS	storana	within es	ma vac	امء		450		(47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) f community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year c) (52) Energy lost from water storage, kWh/year c) (52) Energy lost from water storage, kWh/year c) (52) Energy lost from water storage, kWh/year c) (53) Energy lost from storage, kWh/year c) (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) × (41)m)	•		` ,					•		arric vos.	301		150		(47)
a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) x (41)m)	Otherw	vise if no	stored			•			` '	ers) ente	er '0' in (47)			
Energy lost from water storage, kWh/year (48) x (49) = 0.98 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month (48) x (49) = 0.98 (50) 0 (51) (51) (52) (52) (53) (54) (55) Water storage loss calculated for each month ((56)m = (55) x (41)m)		_		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	.63		(48)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) × (41)m)	Tempe	rature f	actor fro	m Table	2b							0	.6		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) × (41)m) (51) 0 (52) (52) 0 (53) (54) (55)	Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	.98		(50)
If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) × (41)m) (52) (52) (53) (54) (55)	•				-										
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Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ (53) $((56)m = (55) \times (41)m)$		-	_		JII 4.5								0		(52)
Enter (50) or (54) in (55) 0.98 Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	Tempe	rature f	actor fro	m Table	2b										
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
	Enter	(50) or ((54) in (5	55)	-							0.	.98		
(56)m= 30.32 27.38 30.32 29.34 30.32 29.34 30.32 29.34 30.32 29.34 30.32 (56)	Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
	(56)m=	30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(56)

If cylinder contains dedica	ted solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 30.32 27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(57)
Primary circuit loss (a	annual) fro	m Table	3							0		(58)
Primary circuit loss c	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by factor	from Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)	_		
(59)m= 23.26 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculate	d for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required for	r water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	1
(62)m= 201.26 177.56	186.87	168.06	165.08	148.07	142.74	155.89	155.38	174.24	183.56	196.6		(62)
Solar DHW input calculate	d using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wat	er heating)	•	
(add additional lines	f FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (3)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water he	ater	-	-	-	-	-	-	-	-	-	•	
(64)m= 201.26 177.56	186.87	168.06	165.08	148.07	142.74	155.89	155.38	174.24	183.56	196.6		
	•					Outp	out from w	ater heate	r (annual)	I12	2055.31	(64)
Heat gains from water	r heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m= 91.97 81.66	87.18	80.12	79.94	73.47	72.51	76.88	75.91	82.98	85.27	90.42		(65)
include (57)m in ca	lculation	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal gains (se	o Toblo F	1 1										
	e rable t	and 5a										
):					•		-		
Met <mark>abolic</mark> gains (Tab	le 5), Wat	ts		Jun	Jul	Aug	Sep	Oct	Nov	Dec	_	
	le 5), Wat Mar		May	Jun 118.6	Jul	Aug 118.6	Sep	Oct 118.6	Nov 118.6	Dec 118.6	Т	(66)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6	Mar 118.6	ts Apr 118.6	May 118.6	118.6	118.6	118.6	118.6		_	 		(66)
Met <mark>abolic</mark> gains (Tab	Mar 118.6	ts Apr 118.6	May 118.6	118.6	118.6	118.6	118.6		_	 		(66) (67)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61	Mar 118.6 ated in Ap	Apr 118.6 opendix 10.23	May 118.6 L, equati	118.6 ion L9 oi 6.45	118,6 r L9a), a 6.97	118.6 Iso see	118.6 Table 5	1 <mark>18.6</mark>	118.6	118.6		, ,
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca	Mar 118.6 ated in Ap 13.51 culated ir	Apr 118.6 opendix 10.23	May 118.6 L, equati	118.6 ion L9 oi 6.45	118,6 r L9a), a 6.97	118.6 Iso see	118.6 Table 5	15.45 ble 5	118.6	118.6		, ,
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calculation) (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96	Mar 118.6 ated in Ap 13.51 culated in 206.47	Apr 118.6 ppendix 10.23 Appendix 194.79	May 118.6 L, equati 7.64 dix L, equali	118.6 ion L9 or 6.45 uation L	118,6 r L9a), a 6.97 13 or L1 156.94	118.6 Iso see 9.06 3a), also	118.6 Table 5 12.17 See Ta 160.25	15.45 ble 5	118.6	118.6		(67)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul	Mar 118.6 ated in Ap 13.51 lculated ir 206.47	Apr 118.6 opendix 10.23 Append 194.79 ppendix	May 118.6 L, equati 7.64 dix L, equat 180.05 L, equat	118.6 ion L9 or 6.45 uation L 166.2 ion L15	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a)	118.6 lso see 9.06 3a), also 154.76	118.6 Table 5 12.17 See Ta 160.25	118.6 15.45 ble 5 171.93	118.6 18.03 186.67	118.6 19.22 200.52		(67) (68)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul (69)m= 34.86 34.86	Mar 118.6 ated in Ap 13.51 culated in A 206.47 lated in A 34.86	Apr 118.6 opendix 10.23 n Append 194.79 opendix 34.86	May 118.6 L, equati 7.64 dix L, equali	118.6 ion L9 or 6.45 uation L	118,6 r L9a), a 6.97 13 or L1 156.94	118.6 Iso see 9.06 3a), also	118.6 Table 5 12.17 See Ta 160.25	15.45 ble 5	118.6	118.6		(67)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul	Mar 118.6 ated in Ap 13.51 culated in A 206.47 lated in A 34.86	Apr 118.6 opendix 10.23 n Append 194.79 opendix 34.86	May 118.6 L, equati 7.64 dix L, equat 180.05 L, equat	118.6 ion L9 or 6.45 uation L 166.2 ion L15	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a)	118.6 lso see 9.06 3a), also 154.76	118.6 Table 5 12.17 See Ta 160.25	118.6 15.45 ble 5 171.93	118.6 18.03 186.67	118.6 19.22 200.52		(67) (68)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul (69)m= 34.86 34.86 Pumps and fans gain	Mar 118.6 ated in Ap 13.51 lculated ir A 34.86 s (Table 6	Apr 118.6 opendix 10.23 n Append 194.79 opendix 34.86 5a)	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 lso see 9.06 3a), also 154.76), also se 34.86	118.6 Table 5 12.17 o see Ta 160.25 ee Table 34.86	15.45 ble 5 171.93 5 34.86	118.6 18.03 186.67 34.86	118.6 19.22 200.52 34.86		(67) (68) (69)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul (69)m= 34.86 34.86 Pumps and fans gain (70)m= 0 0	Mar 118.6 ated in Ap 13.51 culated ir 206.47 lated in A 34.86 s (Table 5	Apr 118.6 opendix 10.23 n Append 194.79 opendix 34.86 5a)	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 lso see 9.06 3a), also 154.76), also se 34.86	118.6 Table 5 12.17 o see Ta 160.25 ee Table 34.86	15.45 ble 5 171.93 5 34.86	118.6 18.03 186.67 34.86	118.6 19.22 200.52 34.86		(67) (68) (69)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul (69)m= 34.86 34.86 Pumps and fans gain (70)m= 0 0 Losses e.g. evaporat (71)m= -94.88 -94.88	Mar 118.6 ated in Ap 13.51 culated ir 206.47 lated in A 34.86 s (Table 5 0 ion (negar	Apr 118.6 opendix 10.23 n Append 194.79 opendix 34.86 5a) 0	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86 0 es) (Tab	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 le 5)	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 lso see 9.06 3a), also 154.76 , also se 34.86	118.6 Table 5 12.17 See Ta 160.25 ee Table 34.86	15.45 ble 5 171.93 5 34.86	118.6 18.03 186.67 34.86	118.6 19.22 200.52 34.86		(67) (68) (69) (70)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul (69)m= 34.86 34.86 Pumps and fans gain (70)m= 0 0 Losses e.g. evaporate	Mar 118.6 ated in Ap 13.51 lculated in A 34.86 s (Table 5 0 ion (negai -94.88 (Table 5)	Apr 118.6 opendix 10.23 n Append 194.79 opendix 34.86 5a) 0	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86 0 es) (Tab	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 le 5)	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 lso see 9.06 3a), also 154.76 , also se 34.86	118.6 Table 5 12.17 See Ta 160.25 ee Table 34.86	15.45 ble 5 171.93 5 34.86	118.6 18.03 186.67 34.86	118.6 19.22 200.52 34.86		(67) (68) (69) (70)
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Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul (69)m= 34.86 34.86 Pumps and fans gain (70)m= 0 0 Losses e.g. evaporat (71)m= -94.88 -94.88 Water heating gains (72)m= 123.61 121.52	Mar 118.6 ated in Ap 13.51 culated in A 34.86 s (Table 5 0 ion (negar -94.88 (Table 5) 117.18	Apr 118.6 opendix 10.23 n Append 194.79 opendix 34.86 5a) 0 tive valu	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equat 34.86 0 es) (Tab	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 le 5) -94.88	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86	118.6 Iso see 9.06 3a), also 154.76), also se 34.86 0	118.6 Table 5 12.17 See Ta 160.25 See Table 34.86 0 -94.88	15.45 ble 5 171.93 5 34.86 0	118.6 18.03 186.67 34.86 0 -94.88	118.6 19.22 200.52 34.86 0 -94.88		(67) (68) (69) (70) (71)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul (69)m= 34.86 34.86 Pumps and fans gain (70)m= 0 0 Losses e.g. evaporat (71)m= -94.88 -94.88 Water heating gains (72)m= 123.61 121.52 Total internal gains	Mar 118.6 ated in Ap 13.51 culated in A 34.86 s (Table 5 0 ion (negar -94.88 (Table 5) 117.18	Apr 118.6 opendix 10.23 n Append 194.79 opendix 34.86 5a) 0 tive valu -94.88	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equati 34.86 0 es) (Tab -94.88	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 le 5) -94.88	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86 0	118.6 lso see 9.06 3a), also 154.76), also se 34.86 0 -94.88	118.6 Table 5 12.17 See Ta 160.25 See Table 34.86 0 -94.88 105.43 + (69)m +	15.45 ble 5 171.93 5 34.86 0 -94.88 111.54 (70)m + (7	118.6 18.03 186.67 34.86 0 -94.88 118.44 1)m + (72	118.6 19.22 200.52 34.86 0 -94.88 121.53		(67) (68) (69) (70) (71) (72)
Metabolic gains (Tab Jan Feb (66)m= 118.6 118.6 Lighting gains (calcul (67)m= 18.7 16.61 Appliances gains (ca (68)m= 209.78 211.96 Cooking gains (calcul (69)m= 34.86 34.86 Pumps and fans gain (70)m= 0 0 Losses e.g. evaporat (71)m= -94.88 -94.88 Water heating gains (72)m= 123.61 121.52 Total internal gains (73)m= 410.68 408.67	Mar 118.6 ated in Ap 13.51 culated ir 206.47 lated in A 34.86 s (Table 5 0 ion (negar -94.88 (Table 5) 2 117.18 = 395.74	118.6 ppendix 10.23 Appendix 194.79 ppendix 34.86 5a) 0 tive valu -94.88	May 118.6 L, equati 7.64 dix L, equ 180.05 L, equati 34.86 0 es) (Tab -94.88 107.44	118.6 ion L9 or 6.45 uation L 166.2 ion L15 34.86 0 le 5) -94.88	118,6 r L9a), a 6.97 13 or L1 156.94 or L15a) 34.86 0 -94.88 97.46 m + (67)m 319.95	118.6 so see	118.6 Table 5 12.17 See Ta 160.25 See Table 34.86 0 -94.88 105.43 + (69)m + 336.42	15.45 ble 5 171.93 5 34.86 0 -94.88 111.54 (70)m + (7357.49)	118.6 18.03 186.67 34.86 0 -94.88 118.44 1)m + (72 381.71	118.6 19.22 200.52 34.86 0 -94.88 121.53 m 399.86		(67) (68) (69) (70) (71) (72)

Table 6b

Table 6c

Table 6a

m²

Table 6d

(W)

N. d.		1		i		1				1		_
Northeast _{0.9x}	0.3	X	2.4	Х	11.28	X	0.53	X	0.7	=	2.71	(75)
Northeast _{0.9x}	0.3	X	2.6	X	11.28	X	0.53	X	0.7	=	2.94	(75)
Northeast 0.9x	0.3	X	2.4	X	22.97	X	0.53	X	0.7	=	5.52	(75)
Northeast 0.9x	0.3	X	2.6	X	22.97	X	0.53	X	0.7	=	5.98	(75)
Northeast 0.9x	0.3	X	2.4	X	41.38	X	0.53	X	0.7	=	9.95	(75)
Northeast _{0.9x}	0.3	X	2.6	X	41.38	X	0.53	X	0.7	=	10.78	(75)
Northeast 0.9x	0.3	X	2.4	x	67.96	X	0.53	X	0.7	=	16.34	(75)
Northeast _{0.9x}	0.3	X	2.6	X	67.96	X	0.53	X	0.7	=	17.7	(75)
Northeast 0.9x	0.3	X	2.4	X	91.35	X	0.53	X	0.7	=	21.96	(75)
Northeast 0.9x	0.3	X	2.6	x	91.35	X	0.53	X	0.7] =	23.79	(75)
Northeast _{0.9x}	0.3	X	2.4	x	97.38	x	0.53	X	0.7	=	23.41	(75)
Northeast 0.9x	0.3	X	2.6	x	97.38	X	0.53	X	0.7	=	25.36	(75)
Northeast 0.9x	0.3	x	2.4	х	91.1	X	0.53	X	0.7	=	21.9	(75)
Northeast 0.9x	0.3	x	2.6	x	91.1	x	0.53	x	0.7] =	23.73	(75)
Northeast 0.9x	0.3	x	2.4	x	72.63	x	0.53	x	0.7] =	17.46	(75)
Northeast 0.9x	0.3	x	2.6	х	72.63	x	0.53	x	0.7] =	18.92	(75)
Northeast 0.9x	0.3	x	2.4	x	50.42	x	0.53	x	0.7	=	12.12	(75)
Northeast 0.9x	0.3	X	2.6	X	50.42	Х	0.53	X	0.7		13.13	(75)
Northeast _{0.9x}	0.3	x	2.4	х	28.07	х	0.53	x	0.7	i -	6.75	(75)
Northeast _{0.9x}	0.3	X	2.6	х	28.07	×	0.53	x	0.7	j =	7.31	(75)
Northeast _{0.9x}	0.3	X	2.4	x	14.2	x	0.53	x	0.7	j =	3.41	(75)
Northeast _{0.9x}	0.3	x	2.6	х	14.2	х	0.53	x	0.7	j =	3.7	(75)
Northeast _{0.9x}	0.3	X	2.4	x	9.21	X	0.53	x	0.7	j =	2.22	(75)
Northeast 0.9x	0.3	X	2.6	х	9.21	x	0.53	x	0.7	j =	2.4	(75)
East 0.9x	0.77	x	2.6	x	19.64	x	0.53	x	0.7	j =	26.26	(76)
East 0.9x	0.77	x	2.6	x	19.64	x	0.53	X	0.7	j =	26.26	(76)
East 0.9x	0.77	x	2.6	x	19.64	x	0.53	X	0.7	j =	26.26	(76)
East 0.9x	0.77	X	2.6	х	38.42	X	0.53	X	0.7	j =	51.37	(76)
East 0.9x	0.77	x	2.6	x	38.42	x	0.53	X	0.7	j =	51.37	(76)
East 0.9x	0.77	x	2.6	х	38.42	X	0.53	X	0.7	j =	51.37	(76)
East 0.9x	0.77	X	2.6	х	63.27	X	0.53	X	0.7	i =	84.59	(76)
East 0.9x	0.77	X	2.6	х	63.27	X	0.53	X	0.7	=	84.59	(76)
East 0.9x	0.77	X	2.6	х	63.27	X	0.53	X	0.7	=	84.59	(76)
East 0.9x		X	2.6	х	92.28	X	0.53	X	0.7	i =	123.37	(76)
East 0.9x	0.77	X	2.6	х	92.28	X	0.53	X	0.7	i =	123.37	(76)
East 0.9x		X	2.6	x	92.28	X	0.53	x	0.7	,] =	123.37	(76)
East 0.9x		X	2.6	x	113.09	X	0.53	x	0.7]] =	151.2	(76)
East 0.9x	0.77	X	2.6	x	113.09	X	0.53	x	0.7] =	151.2	(76)
East 0.9x	0.77) X	2.6	x	113.09	X	0.53	x	0.7]] =	151.2	(76)
East 0.9x		X	2.6	x	115.77	l X	0.53	x	0.7]] =	154.78	(76)
East 0.9x		X	2.6	x	115.77	l X	0.53	x	0.7] =	154.78	(76)
- 311	····	1		I	1.5,	I	0.00		· · · · · · · · · · · · · · · · · · ·	ı		」 ` ′

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East	0.9x	0.77		X	2.6	X	1	15.77	X		0.53	X	0.7	=	154.78	(76)
East	0.9x	0.77		X	2.6	X	1	10.22	X		0.53	X	0.7	=	147.35	(76)
East	0.9x	0.77		X	2.6	X	1	10.22	X		0.53	X	0.7	=	147.35	(76)
East	0.9x	0.77		X	2.6	X	1	10.22	X		0.53	X	0.7	=	147.35	(76)
East	0.9x	0.77		X	2.6	X	9	4.68	X		0.53	X	0.7	=	126.58	(76)
East	0.9x	0.77		x	2.6	X	9	4.68	X		0.53	X	0.7	=	126.58	(76)
East	0.9x	0.77		x	2.6	X	9	4.68	X		0.53	X	0.7	=	126.58	(76)
East	0.9x	0.77		x	2.6	X	7	3.59	x		0.53	×	0.7	=	98.38	(76)
East	0.9x	0.77		x	2.6	X	7	3.59	X		0.53	x	0.7	=	98.38	(76)
East	0.9x	0.77		x	2.6	X	7	3.59	X		0.53	x	0.7	=	98.38	(76)
East	0.9x	0.77		x	2.6	X	4	5.59	X		0.53	x	0.7	=	60.95	(76)
East	0.9x	0.77		x	2.6	X	4	5.59	X		0.53	x	0.7	=	60.95	(76)
East	0.9x	0.77		x	2.6	X	4	5.59	X		0.53	×	0.7		60.95	(76)
East	0.9x	0.77		x	2.6	x	2	4.49	x		0.53	×	0.7		32.74	(76)
East	0.9x	0.77		x	2.6	X	2	4.49	x		0.53	×	0.7	=	32.74	(76)
East	0.9x	0.77		x	2.6	x	2	4.49	x		0.53	×	0.7	=	32.74	(76)
East	0.9x	0.77		x	2.6	X	1	6.15	x		0.53	×	0.7		21.59	(76)
East	0.9x	0.77		x	2.6	X	1	6.15	Х		0.53	х	0.7		21.59	(76)
East	0.9x	0.77		x	2.6	x	1	6.15	х		0.53	х	0.7	=	21.59	(76)
South	0.9x	0.77		x	2.6	х	4	6.75	j x		0.53	х	0.7	<u> </u>	62.5	(78)
South	0.9x	0.77		x	2.6	X	7	6.57	x		0.53	х	0.7	=	102.37	(78)
South	0.9x	0.77		x	2.6	x	9	7.53	Х		0.53	х	0.7		130.4	(78)
South	0.9x	0.77		x	2.6	j x	1	10.23	X		0.53	x	0.7		147.38	(78)
South	0.9x	0.77		x	2.6	x	1	14.87	x		0.53	х	0.7	=	153.58	(78)
South	0.9x	0.77		x	2.6	X	1	10.55	x		0.53	×	0.7	-	147.8	(78)
South	0.9x	0.77		x	2.6	X	1	08.01	x		0.53	×	0.7	=	144.4	(78)
South	0.9x	0.77		x	2.6	X	1	04.89	x		0.53	×	0.7	=	140.24	(78)
South	0.9x	0.77		x	2.6	x	1	01.89	x		0.53	×	0.7	=	136.21	(78)
South	0.9x	0.77		x	2.6	X	8	2.59	x		0.53	×	0.7	=	110.41	(78)
South	0.9x	0.77		x	2.6	X	5	5.42	X		0.53	×	0.7		74.09	(78)
South	0.9x	0.77		x	2.6	X		40.4	x		0.53	×	0.7	-	54.01	(78)
	_			,		_			_							_
Solar ga	ains in	watts, ca	alcula	ted	for each mor	th			(83)m	n = Sur	n(74)m	(82)m			_	
(83)m=	146.93	267.97	404.	.9	551.53 652.9	2	660.9	632.1	556	.34	456.62	307.3	2 179.42	123.4		(83)
Total ga	ins – ir	nternal a	nd so	olar	(84)m = (73) i	n + (83)m	, watts							-	
(84)m=	557.6	676.64	800.6	64	926.41 1006.	64 9	94.18	952.05	882	.08	793.04	664.8	1 561.14	523.26]	(84)
7. Mea	n inter	nal temp	eratu	ıre (heating seas	on)										
Tempe	rature	during h	eatin	g pe	eriods in the I	iving	area	from Tal	ole 9	, Th1	(°C)				21	(85)
Utilisa <u>t</u>	ion fac	tor for g	ains f	or li	ving area, h1	,m (s	ee Ta	ble 9a)							_	_
	Jan	Feb	Ма	ar	Apr Ma	у	Jun	Jul	A	ug	Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.98	0.9	5	0.85 0.67		0.48	0.34	0.3	39	0.63	0.91	0.99	1		(86)
Mean i	nterna	temper	ature	in li	ving area T1	(follo	ow ste	ps 3 to 7	7 in T	able	9c)					
_	20.06	20.26	20.5	-	20.83 20.9	·	21	21	2		20.98	20.77	20.35	20.02]	(87)
_					•								-	-	-	

Tomp	oraturo	during k	neating p	oriode ir	roct of	dwelling	from To	ble 0 T	h2 (°C)					
(88)m=	20.06	20.06	20.07	20.08	20.08	20.09	20.09	20.09	20.09	20.08	20.08	20.07		(88)
. ,		<u>!</u>	ains for				<u> </u>	<u> </u>						
(89)m=	0.99	0.98	0.94	0.81	0.61	0.41	0.27	0.31	0.56	0.88	0.98	0.99		(89)
Mean	interna	ıl tempeı	rature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)		<u>.</u>		
(90)m=	18.81	19.11	19.51	19.89	20.05	20.09	20.09	20.09	20.07	19.83	19.26	18.77		(90)
			•						f	LA = Livin	g area ÷ (4	4) =	0.44	(91)
Mean	interna	ıl tempeı	rature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2			•		
(92)m=	19.36	19.61	19.96	20.3	20.44	20.48	20.49	20.49	20.47	20.24	19.73	19.32		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.36	19.61	19.96	20.3	20.44	20.48	20.49	20.49	20.47	20.24	19.73	19.32		(93)
			uirement											
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.99	0.98	0.93	0.82	0.64	0.44	0.3	0.34	0.59	0.89	0.98	0.99		(94)
Usefu		hmGm	, W = (9	4)m x (84	4)m				i					
(95)m=	552.59	660.53	747.35	758.39	639.53	437.01	290.06	303.93	467	588.81	549.34	519.79		(95)
		T	ernal tem											(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
пеаі (97)m=	1167.8		an intern 1038.11	866.37	662.66	439.39	290.3	304.4	478.28	730.43	963.1	1158.98		(97)
			ement fo									1.00.00		(- /
(98)m=	457.72	320.82	216.33	77.74	17.21	0	0	0	0	105.37	297.91	475.56		
			•		l		l .	Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1968.66	(98)
Space	e heatin	g requir	ement in	kWh/m²	² /year							ĺ	26.07	(99)
9b. En	ergy red	quireme	nts – Cor	nmunity	heating	scheme								
			oace hea								unity sch	neme.		—
	•		from se	•	• •	•		(Lable 1	1) '0' if n	one		ļ	0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
	-		y obtain he s, geotherr							up to four (other heat	sources; th	ne latter	
			Commun			,		,,,,					1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.25	(306)
Space	heatin	g											kWh/ye	ar
Annua	l space	heating	requiren	nent									1968.66	
Space	heat fro	om Com	munity h	eat pum	р				(98) x (30	04a) x (305	5) x (306) =	= [2460.83	(307a)
Efficier	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[0	(308

Space heating requirement from secondary/supplementary syst	tem (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		2055.31	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2569.14	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	50.3	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside	196.65	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	196.65	(331)
Energy for lighting (calculated in Appendix L)		330.28	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-494.01	(333)
Electricity generated by wind turbine (Appendix M) (negative qu	antity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
CO2 associated with heat source 1 [(307b)+	(0.05)] X 100 : (0075) X 0.052	kg CO2/year 319 818.35	(367a) (367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fuel -(310b)] x 100 ÷ (367b) x 0.52	kg CO2/year 319 818.35 26.11	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fuel -(310b)] x 100 ÷ (367b) x 0.52 [(313) x 0.52 = (363)(366) + (368)(372)	kg CO2/year 319 818.35 26.11 844.46	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fuel -(310b)] x 100 ÷ (367b) x 0.52 [(313) x 0.52 = (363)(366) + (368)(372) = (309) x 0	kg CO2/year 319 818.35 26.11 844.46	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fuel (310b)] x 100 ÷ (367b) x 0.52 [(313) x 0.52 = (363)(366) + (368)(372) = eous heater (312) x 0.52	kg CO2/year 319 818.35 26.11 844.46 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance Total CO2 associated with space and water heating	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fuel -(310b)] x 100 ÷ (367b) x	kg CO2/year 319 818.35 26.11 844.46 0 844.46	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwell	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fuel -(310b)] x 100 ÷ (367b) x	kg CO2/year 319 818.35 26.11 844.46 0 844.46 102.06	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwell CO2 associated with electricity for lighting	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fuel -(310b)] x 100 ÷ (367b) x	kg CO2/year 319 818.35 26.11 844.46 0 844.46 102.06	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwell	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fuel -(310b)] x 100 ÷ (367b) x	kg CO2/year 319 818.35 26.11 844.46 0 844.46 102.06	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwell CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as applications.	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fue (310b)] x 100 ÷ (367b) x	kg CO 2/year 319 818.35 26.11 844.46 0 844.46 102.06 171.42	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantance Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwell CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as application.	kWh/year kg CO2/kWh g two fuels repeat (363) to (366) for the second fue (310b)] x 100 ÷ (367b) x	kg CO 2/year 319 818.35 26.11 844.46 0 844.46 102.06 171.42	(367) (372) (373) (374) (375) (376) (378) (379) (380)

		User D	Details:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	-			Versic	on: 1.0.4.26	
		Property	Address:						
Address :	The Charlie Ratchford Cen	tre, Belm	ont Stree	t, LONI	OON, NV	V1 8HF			
1. Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)	7	Volume(m ³	<u>-</u>
Ground floor			75.5	(1a) x	2	2.8	(2a) =	211.4	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	75.5	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	211.4	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0	= [0	x 2	20 =	0	(6b)
Number of intermittent far	ns			Ī	3	x	10 =	30	(7a)
Number of passive vents				Ī	0	x .	10 =	0	(7b)
Number of flueless gas fin	res			Ī	0	X 4	40 =	0	(7c)
				_			A : I-		
				_			Air cn	nanges per ho	our —
	/s, flues and fans = (6a)+(6b)+(een carried out or is intended, proce			ontinuo fr	30		÷ (5) =	0.14	(8)
Number of storeys in the		eu 10 (17),	otriei wise c	onunde ii	om (9) to (10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame o	r 0.35 fo	r masonr	y constr	uction			0	(11)
	resent, use the value corresponding t	o the grea	ter wall area	a (after			'		
deducting areas of opening	lgs);).1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, ent	,	(000	,,					0	(13)
•	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
•	q50, expressed in cubic metr	•	•	•	etre of e	nvelope	area	5	(17)
·	ity value, then $(18) = [(17) \div 20] +$							0.39	(18)
	s if a pressurisation test has been do	ne or a de	gree air per	meability	is being u	sed			7,40
Number of sides sheltere Shelter factor	a		(20) = 1 - [0.075 x (1	19)] =			0.85	(19)
Infiltration rate incorporati	ing shelter factor		(21) = (18)		/ -			0.33	(21)
Infiltration rate modified for			, , , ,	` '				0.55	()
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7		<u> </u>	·				1	
 	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Mind Factor (OC.)	2)							•	
Wind Factor (22a)m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m =	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
(224)111 1.21 1.20	1.00 0.93	1 0.55	0.02	•	I 1.00	I '' ²	L ''0	I	

0.42	ation rate (a	41 0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39		
Calculate effe		-	the appli	icable ca	ise		<u>!</u>					
If mechanica										Ţ	0	(2
If exhaust air h) = (23a)		Ţ	0	(2
If balanced with										L	0	(2
a) If balance		1	1	i	- 	, 	í `	<u> </u>		- ` 	÷ 100]	,
4a)m= 0		0 0	0	0	0	0	0	0	0	0		(2
b) If balance			1			- ^ ` ` - 	í `	 				
4b)m= 0	<u> </u>	0 0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse extrac n < 0.5 × (23		•	•				5 × (23b)			
4c)m= 0	0	0 0	0	0	0	0	0	0	0	0		(
d) If natural if (22b)n	ventilation on $= 1$, then (0.5]				
4d)m= 0.59	0.59 0.	58 0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(
Effective air	change rate	e - enter (24	a) or (24l	b) or (24	c) or (24	d) in bo	x (25)					
5)m= 0.59	0.59 0.	58 0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(
Heat losse	s and heat l	oss parame	er:							_	_	
LEMENT	Gross area (m²	Openi		Net Ar A ,r		U-val W/m2		A X U (W/I	〈)	k-value		A X k kJ/K
oors	, i			2.4	x	1.2	= [2.88				(
indows Type	e 1			1.53	x1	/[1/(1.4)+	0.04] =	2.03	Ħ			(
indows Type	2			1.66	x1	/[1/(1.4)+	0.04] =	2.2	Ħ			(
indows Type	3			1.66	x1	/[1/(1.4)+	0.04] =	2.2	片			(
indows Type	4			1.66	x1	/[1/(1.4)+	· 0.04] =	2.2				(
indows Type				1.66	= .	/[1/(1.4)+	l.	2.2				(
indows Type				1.66	二 .	/[1/(1.4)+	l.	2.2				(
alls Type1	60.48	18.8	87	41.61	=	0.18		7.49	╡┌		-	(
alls Type2	20.16		<u>"</u>	20.16	=	0.18	-	3.63	북 ¦		╡	(
oof	75.5			75.5	=	0.13	- - -	9.81	᠆		╡┝	(
otal area of e				156.1	=	0.13		9.01				·)\ (
or windows and			indow U-v			n formula 1	1/[(1/LI-valu	ıe)+0 041 a	ıs aiven in	naragraph	32	(
	as on both side				atou dom	, romaia i	7[(17 0 Valo	10/10:01/4	o givoii iii	paragrapii	0.2	
bric heat los	ss, $W/K = S$	(A x U)				(26)(30) + (32) =			[45.65	(
	Cm = S(A x)	k)					((28)	(30) + (32	2) + (32a).	(32e) =	0	(
eat capacity		TMP = Cm	÷ TFA) iı	n kJ/m²K	, L		Indica	tive Value:	Medium	Ī	250	(
	parameter ((· · · · · ·	•							-		
ermal mass r design assess	sments where t	he details of th	,	tion are no	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
eat capacity nermal mass or design assess n be used inste nermal bridge	sments where to ad of a detailed	he details of the calculation.	e construci			recisely the	e indicative	e values of	TMP in Ta	able 1f	7.78	(1

Ventila	tion hea	at loss ca	alculated	l monthly	У				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	41.17	40.93	40.69	39.56	39.35	38.37	38.37	38.19	38.75	39.35	39.78	40.23		(38)
Heat tr	ansfer o	coefficier	nt, W/K					•	(39)m	= (37) + (37)	38)m			
(39)m=	94.6	94.36	94.12	92.99	92.78	91.8	91.8	91.62	92.18	92.78	93.21	93.65		
Heat Id	ss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	92.99	(39)
(40)m=	1.25	1.25	1.25	1.23	1.23	1.22	1.22	1.21	1.22	1.23	1.23	1.24		
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.23	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ener	rgy requi	rement:								kWh/ye	ear:	
Assum	ed occu	ıpancy, İ	N								2	.37		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		.51		(12)
								(25 x N)).53		(43)
			hot water person per				-	to achieve	a water us	se target o	†			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						Sep	Oct	INOV	Dec		
(44)m=	99.59	95.97	92.34	88.72	85.1	81.48	81.48	85.1	88.72	92.34	95.97	99.59		
Energy o	content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1086.4	(44)
(45)m=	147.68	129.17	133.29	116.2	111.5	96.22	89.16	102.31	103.53	120.66	131.71	143.02		
, ,										Γotal = Su	m(45) ₁₁₂ =	=	1424.45	(45)
If instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(46)m=	22.15	19.37	19.99	17.43	16.72	14.43	13.37	15.35	15.53	18.1	19.76	21.45		(46)
	storage		includin	a any c	olar or M	/\/\LDC	etorago	within sa	mo voc	sol		450		(47)
•		` ,	ind no ta				•		aille ves	5 C I		150		(47)
Otherw	•	stored			•			ombi boil	ers) ente	er '0' in (47)			
	•		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(48)
Tempe	rature f	actor fro	m Table	2b		`	• ,					.54		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	.75		(50)
•			eclared o	-										
			factor fr ee section		e 2 (kWl	h/litre/da	ıy)					0		(51)
	-	from Tal		JII 4.3								0		(52)
			m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
•.		(54) in (5	-						•			.75		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)

If cylinder conta	ins dedicate	ed solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	om Append	lix H	
(57)m= 23.33	3 21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circu	uit loss (ar	nnual) fro	om Table	 e 3	•	•					0		(58)
Primary circu	•	,			59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)		_	
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss o	calculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	quired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 194.2	8 171.25	179.88	161.3	158.09	141.31	135.75	148.91	148.62	167.25	176.8	189.62		(62)
Solar DHW inpu	ut calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add addition	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (3)				_	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 194.2	8 171.25	179.88	161.3	158.09	141.31	135.75	148.91	148.62	167.25	176.8	189.62		
	-	-					Outp	out from wa	ater heate	r (annual) ₁	12	1973.06	(64)
Heat gains fr	rom water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m]	
(65)m= 86.38	76.62	81.59	74.71	74.35	68.07	66.92	71.29	70.5	77.39	79.87	84.83		(65)
in <mark>clude</mark> (57	7)m in c <mark>al</mark>	culation	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ins (Table	e 5), Wat	its										
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 118.6	3 118.6	118.6	118.6	118.6	118.6	118.6	118.6	118.6	118.6	118.6	118.6		(66)
Lighting gair	ıs (calcula	ited in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 18.7	16.61	13.51	10.23	7.64	6.45	6.97	9.06	12.17	15.45	18.03	19.22		(67)
Appliances of	gains (calc	culated in	n Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5	-	-	•	
(68)m= 209.7	8 211.96	206.47	194.79	180.05	166.2	156.94	154.76	160.25	171.93	186.67	200.52		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	tion L15	or L15a)), also se	ee Table	5	-	-	•	
(69)m= 34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86	34.86		(69)
Pumps and f	ans gains	(Table	5a)									•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	on (nega	tive valu	es) (Tab	le 5)	•	•	•		•		•	
(71)m= -94.8	8 -94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88	-94.88		(71)
Water heating	ng gains (∃	rable 5)	•			•	•	•		•	•	•	
(72)m= 116.1	114.01	109.67	103.77	99.93	94.54	89.95	95.83	97.91	104.02	110.92	114.02		(72)
Total intern	al gains =	• •	!		(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72))m	•	
(73)m= 406.1	6 404.16	391.23	370.36	349.21	328.76	315.44	321.23	331.91	352.98	377.2	395.35		(73)
6. Solar gai	ns:												
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	e applicat	ole orientat	tion.		
Orientation:			Area		Flu			g		FF		Gains	
	Table 6d	l	m²		Tal	ble 6a	Т	able 6b	T	able 6c		(W)	

Northeast 0.9			1		1		1		۱		ı		7(75)
Northeast 0.9		0.3	X	1.53	X	11.28	X	0.63	X	0.7	= 	2.06	(75)
		0.3	X	1.66	X	11.28	X	0.63	X	0.7	= 	2.23	(75)
Northeast 0.9		0.3	X	1.53	X	22.97	X I	0.63	X	0.7	= 	4.18	(75)
Northeast 0.9		0.3	X	1.66	X	22.97	X	0.63	X	0.7	= 	4.54	(75)
Northeast 0.9		0.3	X	1.53	X	41.38	X	0.63	X	0.7	=	7.54	(75)
Northeast 0.9		0.3	X	1.66	X	41.38	X	0.63	X	0.7	=	8.18	<u> </u> (75)
Northeast 0.9		0.3	X	1.53	X	67.96	X	0.63	X	0.7	=	12.38	<u> </u> (75)
Northeast 0.9		0.3	X	1.66	X	67.96	X	0.63	X	0.7	=	13.43	<u> </u> (75)
Northeast 0.9		0.3	X	1.53	X	91.35	X	0.63	X	0.7	=	16.64	<u> </u> (75)
Northeast 0.9		0.3	X	1.66	X	91.35	X	0.63	X	0.7	=	18.06	<u> </u> (75)
Northeast 0.9		0.3	X	1.53	X	97.38	X	0.63	X	0.7	=	17.74	(75)
Northeast 0.9		0.3	X	1.66	X	97.38	X	0.63	X	0.7	=	19.25	(75)
Northeast 0.9		0.3	X	1.53	X	91.1	X	0.63	X	0.7	=	16.6	(75)
Northeast 0.9		0.3	X	1.66	X	91.1	X	0.63	X	0.7	=	18.01	(75)
Northeast 0.9		0.3	X	1.53	X	72.63	X	0.63	X	0.7	=	13.23	(75)
Northeast 0.9		0.3	X	1.66	x	72.63	X	0.63	X	0.7	=	14.36	(75)
Northeast 0.9		0.3	X	1.53	X	50.42	X	0.63	X	0.7	=	9.19	(75)
Northeast 0.9		0.3	X	1.66	X	50.42	Х	0.63	X	0.7	=	9.97	(75)
Northeast 0.9		0.3	X	1.53	Х	28.07	×	0.63	X	0.7	=	5.11	(75)
Northeast 0.9	x	0.3	X	1.66	х	28.07	×	0.63	X	0.7	=	5.55	(75)
Northeast 0.9	x	0.3	X	1.53	X	14.2	x	0.63	X	0.7	=	2.59	(75)
Northeast 0.9	x	0.3	x	1.66	x	14.2	Х	0.63	x	0.7	=	2.81	(75)
Northeast 0.9		0.3	x	1.53	x	9.21	X	0.63	x	0.7	=	1.68	(75)
Northeast 0.9	x	0.3	X	1.66	х	9.21	X	0.63	X	0.7	=	1.82	(75)
East 0.9	x	0.77	x	1.66	x	19.64	X	0.63	x	0.7	=	19.93	(76)
East 0.9	x	0.77	x	1.66	x	19.64	X	0.63	x	0.7	=	19.93	(76)
East 0.9	x	0.77	X	1.66	X	19.64	X	0.63	X	0.7	=	19.93	(76)
East 0.9	x	0.77	x	1.66	x	38.42	X	0.63	x	0.7	=	38.98	(76)
East 0.9	x	0.77	x	1.66	x	38.42	X	0.63	x	0.7	=	38.98	(76)
East 0.9	x	0.77	X	1.66	X	38.42	X	0.63	X	0.7	=	38.98	(76)
East 0.9	x	0.77	x	1.66	x	63.27	X	0.63	x	0.7	=	64.2	(76)
East 0.9	x	0.77	×	1.66	x	63.27	x	0.63	x	0.7	=	64.2	(76)
East 0.9	x	0.77	X	1.66	x	63.27	x	0.63	x	0.7	=	64.2	(76)
East 0.9	x	0.77	x	1.66	x	92.28	x	0.63	x	0.7	=	93.63	(76)
East 0.9	x	0.77	X	1.66	X	92.28	x	0.63	x	0.7	=	93.63	(76)
East 0.9	x	0.77	×	1.66	x	92.28	x	0.63	x	0.7	=	93.63	(76)
East 0.9	x	0.77	×	1.66	x	113.09	x	0.63	x	0.7	=	114.75	(76)
East 0.9	x	0.77	×	1.66	x	113.09	x	0.63	x	0.7	=	114.75	(76)
East 0.9	x	0.77	×	1.66	x	113.09	x	0.63	x	0.7	=	114.75	(76)
East 0.9	x	0.77	×	1.66	x	115.77	x	0.63	x	0.7	=	117.46	(76)
East 0.9	x	0.77	X	1.66	x	115.77	x	0.63	X	0.7	=	117.46	(76)

East	0.9x	0.77		X	1.66	X		15 77] _x		2.62	×	0.7		117.46	(76)
East	0.9x	0.77		X	1.66] ^] x		15.77 10.22] ^] x		0.63 0.63	_	0.7	$\dashv $	117.46	(76)
East	0.9x	0.77		X	1.66] ^] x		10.22] ^] _x		0.63	 	0.7	╡ -	111.83	(76)
East	0.9x	0.77		X	1.66] ^] x		10.22] ^] x		0.63	 	0.7	╡ -	111.83	(76)
East	0.9x	0.77		X	1.66] ^] x		4.68] ^] _x		0.63	 	0.7	\dashv	96.06	(76)
East	0.9x	0.77		X	1.66] ^] x		4.68] ^] x		0.63	 	0.7	╡ -	96.06	(76)
East	0.9x			X] ^] x] ^] x			_		╡ -		(76)
East	0.9x	0.77		X	1.66] ^] x		3.59] ^] x	_	0.63 0.63	_	0.7	╡ -	96.06	(76)
East	0.9x	0.77		X	1.66] ^] x] ^] x		0.63	 	0.7	╡ -	74.67	(76)
East	0.9x	0.77		X	1.66] ^] x		3.59 3.59] ^] x		0.63	_	0.7	╡ -	74.67	(76)
East	0.9x	0.77		X	1.66] ^] x		5.59] ^] _x		0.63	 	0.7	╡ -	46.26	(76)
East	0.9x	0.77		X	1.66] ^] x		5.59] ^] x		0.63	 	0.7	╡ -	46.26	(76)
East	0.9x	0.77		X	1.66	_ ^ x		5.59] ^] _x		0.63	^ x	0.7	╡ -	46.26	(76)
East	0.9x	0.77		X	1.66] ^] x	_	4.49] ^] _x		0.63	^ x	0.7	\dashv	24.85	(76)
East	0.9x	0.77		X	1.66] ^] x		4.49] ^] _x		0.63	 	0.7	╡ -	24.85	(76)
East	0.9x	0.77	_	X	1.66] ^] x		4.49] ^] x		0.63	 	0.7	╡ -	24.85	(76)
East	0.9x	0.77		X	1.66] ^] x		6.15] ^] _x		0.63	 	0.7	$\dashv $	16.39	(76)
East	0.9x	0.77		x	1.66] ^ x		6.15] ^ x		0.63	X	0.7		16.39	(76)
East	0.9x	0.77		X	1.66] ^] x		6.15) ^ x		0.63	X	0.7	= 1	16.39	(76)
South	0.9x	0.77	\blacksquare	X	1.66) ^	-	6.75] ^]		0.63	- x	0.7	╡ -	47.44	(78)
South	0.9x	0.77		X	1.66	1 ^ 1 x	 	6.57] ^ x		0.63	X	0.7		77.69	(78)
South	0.9x	0.77		X	1.66	X		7.53	X		0.63	X	0.7	= =	98.96	(78)
South	0.9x C	0.77		X	1.66	」^ 【	-	_) ^ x	_	0.63	X	0.7	╡ -		(78)
South	0.9x	0.77	-	X	1.66	\ \ \ \ \	\vdash	10.23] ^] x			X	0.7	╡ [111.85	(78)
South	0.9x	0.77	\dashv	X	1.66			10.55] ^] _x		0.63	^ x	0.7	╡ -	112.17	(78)
South	0.9x			X] ^] x		08.01] ^] x		0.63	_		╡ -	109.59	(78)
South	0.9x	0.77	\equiv	X	1.66	」^]		04.89] ^] x		0.63	_	0.7	╡ [109.59	(78)
South	0.9x	0.77	_	X	1.66] ^] x		01.89] ^] x	_	0.63	^ x	0.7	$\dashv $	103.38	(78)
South	0.9x	0.77		X	1.66] ^] x		2.59] ^] x		0.63	_	0.7	= -	83.79	(78)
South	0.9x			X] ^] x] ^] x			_		╡ -		(78)
South	0.9x	0.77			1.66	╡	-	5.42]]	_	0.63	╡	0.7	=	56.23	(78)
Coun	0.91	0.77		X	1.66	X		40.4	X		0.63	X	0.7	=	40.99	(76)
Solar o	aine in s	watte ca	ماديناء	hat	for each mor	ıth			(83)m	ı – Sun	n(74)m	(82)m				
(83)m=	111.51	203.36	307.2	$\overline{}$	418.55 495.4	$\overline{}$	501.55	479.69	422		346.53	233.2	1	93.65	7	(83)
	ains – ir	nternal a	nd so	olar	$\frac{1}{(84)m = (73)i}$	n +	(83)m	, watts	<u>!</u>					<u> </u>	_	
(84)m=	517.67	607.52	698.	5	788.92 844.	7 8	330.31	795.13	743	.43	678.44	586.2	513.37	489	7	(84)
7 Me	an inter	nal temr	eratu	re (heating seas	on)										
					eriods in the I		area	from Tab	ole 9	. Th1	(°C)				21	(85)
•		_		•	ving area, h1	_			- 3	,	· ·/					` ′
230	Jan	Feb	Ma	-	Apr Ma	Ť	Jun	Jul	А	ug	Sep	Oct	Nov	Dec	7	
(86)m=	1	0.99	0.98	\dashv	0.94 0.84	- 	0.66	0.5	0.5		0.8	0.96	0.99	1	1	(86)
Mean	internal	l temner	ature	in li	iving area T1	(foll	ow ste	ns 3 to 7	in T	ahle	9c)				_	
(87)m=	19.7	19.88	20.1		20.53 20.8	` —	20.95	20.99	20.		20.89	20.51	20.04	19.67	7	(87)
• •			<u> </u>					<u> </u>	<u> </u>					<u> </u>	_	

Temperature during heating periods in rest of dwelling from Table 9,	
(88)m= 19.88 19.88 19.88 19.89 19.9 19.91 19.91 19.91	1 19.9 19.89 19.89 (88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 1 0.99 0.97 0.91 0.78 0.57 0.38 0.43	0.72 0.94 0.99 1 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 t	o 7 in Table 9c)
(90)m= 18.16 18.43 18.84 19.35 19.72 19.88 19.9 19.9	
	$fLA = Living area \div (4) = 0.44$ (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 -$	fl A) x T2
(92)m= 18.83 19.06 19.42 19.86 20.19 20.35 20.38 20.37	
Apply adjustment to the mean internal temperature from Table 4e, w	rhere appropriate
(93)m= 18.83 19.06 19.42 19.86 20.19 20.35 20.38 20.37	
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table	9b, so that Ti,m=(76)m and re-calculate
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug	g Sep Oct Nov Dec
Utilisation factor for gains, hm:	
(94)m= 0.99 0.99 0.97 0.91 0.8 0.61 0.43 0.48	0.75 0.94 0.99 1 (94)
Useful gains, hmGm , W = (94)m x (84)m	(05)
(95)m= 514.37 599.3 675.76 720.69 672.88 504.15 343.13 358.0	9 507.67 552.24 506.78 486.57 (95)
Monthly average external temperature from Table 8	(00)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4	
Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(93)$ (97) m = 1374.9 1336.1 1216 1019.67 787.82 527.57 346.78 364.1	
(97)m= 1374.9 1336.1 1216 1019.67 787.82 527.57 346.78 364.1 Space heating requirement for each month, kWh/month = 0.024 x [(97)m= 1374.9 1336.1 1216 1019.67 787.82 527.57 346.78 364.1	
(98)m= 640.24 495.13 401.94 215.27 85.51 0 0 0	0 227.61 451.36 655.32
	otal per year (kWh/year) = Sum(98) _{15,912} = 3172.37 (98)
Space heating requirement in kWh/m²/year	42.02 (99)
9a. Energy requirements – Individual heating systems including micro	o-CHP)
Space heating:	
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) =	1 – (201) =
Fraction of total heating from main system 1 (204) =	$(202) \times [1 - (203)] = $ 1 (204)
Efficiency of main space heating system 1	93.5 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Au	g Sep Oct Nov Dec kWh/year
Space heating requirement (calculated above)	,
640.24 495.13 401.94 215.27 85.51 0 0 0	0 227.61 451.36 655.32
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
684.75 529.55 429.88 230.23 91.46 0 0 0	0 243.43 482.73 700.88
To the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of th	otal (kWh/year) =Sum(211) _{15,1012} = 3392.91 (211)
Space heating fuel (secondary), kWh/month	
$= \{[(98) \text{m x } (201)] \} \times 100 \div (208)$	
(215)m= 0 0 0 0 0 0 0 0	0 0 0 0
T	otal (kWh/year) =Sum(215) _{15,1012} = 0 (215)

Water heating								
Output from water heater (calculated above) 194.28 171.25 179.88 161.3 158.09 1	141.31 135.75	148.91	148.62	167.25	176.8	189.62		
Efficiency of water heater			ļ	ļ.			79.8	(216)
(217)m= 87.76 87.49 86.9 85.58 83.26	79.8 79.8	79.8	79.8	85.64	87.21	87.86		(217)
Fuel for water heating, kWh/month	•	•						
(219) m = (64) m x $100 \div (217)$ m (219)m = 221.37 195.75 207.01 188.46 189.89 1	177.08 170.12	186.6	186.25	195.3	202.73	215.83		
			I = Sum(2				2336.38	(219)
Annual totals				k\	Wh/year	•	kWh/year	
Space heating fuel used, main system 1	3392.91							
Water heating fuel used							2336.38	
Electricity for pumps, fans and electric keep-hot								
central heating pump:		(230c)						
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							330.28	(232)
12a. CO2 emissions – Individual heating system	ns including mi	cro-CHF						
	Energy			Emiss	ion fac	tor	Em <mark>issio</mark> ns	
	kWh/year			kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.2	16	=	732.87	(261)
Spa <mark>ce he</mark> ating (sec ondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	504.66	(264)
Space and water heating	1237.53	(265)						
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	171.41	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =	[1447.87	(272)

TER =

(273)

28.19

		User D	Details:						
Assessor Name:	Stroma FSAP 2012		Stroma Softwa				Vorsia	on: 1.0.4.26	
Software Name:		Property	Address:				versio	JII. 1.U.4.20	
Address :	The Charlie Ratchford Cent	i i				V1 8HF			
1. Overall dwelling dime		·			,				
		Area	a(m²)		Av. He	ight(m)		Volume(m³)
Ground floor			52	(1a) x	2	2.8	(2a) =	145.6	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	52	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	145.6	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	r
Number of chimneys	0 + 0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0	= [0	x 2	20 =	0	(6b)
Number of intermittent far	ns				0	x ·	10 =	0	(7a)
Number of passive vents				F	0	x -	10 =	0	(7b)
Number of flueless gas fir	res			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	anges per ho	ur
Infilt <mark>ration</mark> due to chi <mark>mne</mark> y	/s, flues and fans = $(6a)+(6b)+(7a)$	7a)+(7b)+((7c) =		0		÷ (5) =	0	(8)
	een carried out or is intended, procee	ed to (17), o	otherwise o	ontinue fr	om (9) to ((16)			_
Number of storeys in the Additional infiltration	ne dweiling (ns)					[(0)]	-1]x0.1 =	0	(9) (10)
	25 for steel or timber frame of	r 0.35 fo	r masonr	v constr	uction	[(0)	1]X0.1 =	0	(11)
	esent, use the value corresponding to			•					()
deducting areas of opening	· · · ·	1 (000)	مطا مامم	ontor O				_	7(40)
If no draught lobby, ent	loor, enter 0.2 (unsealed) or 0	. i (Seale	eu), eise	enter 0				0	(12)
• • • • • • • • • • • • • • • • • • • •	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	es per ho	our per so	quare m	etre of e	nvelope	area	3	(17)
·	ty value, then $(18) = [(17) \div 20] + (18)$							0.15	(18)
	s if a pressurisation test has been do	ne or a deg	gree air per	meability	is being us	sed			7(10)
Number of sides sheltere Shelter factor	α		(20) = 1 - [0.0 75 x (1	19)] =			0.85	(19)
Infiltration rate incorporat	ing shelter factor		(21) = (18)		-			0.13	(21)
Infiltration rate modified for								0.10	(/
	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7			·					
 	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a) (22	2)m : 4	•				•	•	•	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18]	
()	1.00 0.00	1 3.00	3.02	•	L	L <u>2</u>	Lo	I	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effect		_	rate for t	he appli	cable ca	se	l	ı	l			, 	
If mechanica			o dia N. 70	Ol-) (OO -			.IE\\ - (b -		\ (00-\			0.5	(23
If exhaust air he) = (23a)			0.5	(23)
If balanced with		-	-	_								76.5	(23
a) If balance						<u> </u>	- ` ` - 	ŕ	– `		- ` ') ÷ 100] 1	(0.4
(24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	J	(24
b) If balance							r ``	í `	r Ó T		<u> </u>	1	(0.4
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
c) If whole he				•					5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v if (22b)m				•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25
3. Heat losses	s and he	eat loss	paramete	er:								_	
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Doo <mark>rs Type 1</mark>					2.4	x	1.3	=	3.12				(26
Doo <mark>rs Type 2</mark>					2.5	x	1.3	=	3.25	Ħ			(26
Windows Type	1				2.4	x1	/[1/(1.3)+	0.04] =	2.97	Ħ			(27
Vindows Type	2	l			2.6	x1,	/[1/(1.3)+	0.04] =	3.21	5			(27
Vindows Type					2.6	x1.	/[1/(1.3)+	0.04] =	3.21	\exists			(27
Valls Type1	33.3	12	12.5		20.82		0.15		3.12	=			(29
Walls Type2	11.4		0	_	11.48	=	0.14	_	1.62	=		╡ ⊨	(29
Roof	52		0	_	52	x x	0.14	=	5.2	-		-	(30
otal area of e					96.8	= ^	0.1		5.2				(31
for windows and			effective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valı	ıe)+0.041 a	as aiven in	naragraph	132	(51
* include the area						a to a a o		, _{[(1} , 0	,	.o g.v o	paragrap.	. 0.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				25.71	(33
leat capacity	Cm = S(Axk)						((28).	.(30) + (32	2) + (32a).	(32e) =	0	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
For design assess an be used instea				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		_
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix ł	<						4.84	(36
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			30.55	5 (37
entilation hea		alculated	d monthly	/					$= 0.33 \times ($	(25)m x (5))	30.50	, (5)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
38)m= 13.46	13.3	13.15	12.38	12.23	11.47	11.47	11.31	11.77	12.23	12.54	12.84		(38
leat transfer of						<u> </u>		<u> </u>	= (37) + (37)		L	J	•
39)m= 44.01	43.85	43.7	42.93	42.78	42.01	42.01	41.86	42.32	42.78	43.09	43.39	1	
39)[[]= 1 44 []]													

eat loss para	meter (F	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
0.85 O.85	0.84	0.84	0.83	0.82	0.81	0.81	0.81	0.81	0.82	0.83	0.83		
umber of day	s in mor	nth (Tabl	le 1a)						Average =	Sum(40) ₁	12 /12=	0.82	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
					-		-	-	-	-			
I. Water heat	ing ener	gy requi	rement:								kWh/ye	ear:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		75		(42
nnual averageduce the annual the three that 125	e hot wa al average	hot water	usage by	5% if the c	dwelling is	designed			se target o		5.74		(4:
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ii	า litres per	day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)						
4)m= 83.31	80.28	77.26	74.23	71.2	68.17	68.17	71.2	74.23	77.26	80.28	83.31		— ,
nergy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		908.89	(4
5)m= 123.55	108.06	111.51	97.22	93.28	80.49	74.59	85.59	86.62	100.94	110.19	119.65		
									I Total = Su	m(45) ₁₁₂ =	_	1191.69	(4
inst <mark>antane</mark> ous w	ater he <mark>atir</mark>	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46	to (61)					
6)m= 18.53	16.21	16.73	14.58	13.99	12.07	11.19	12.84	12.99	15.14	16.53	17.95		(4
ater storage torage volum		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
community h	,										100		(
therwise if no	_			_			. ,	ers) ente	er '0' in (47)			
ater storage													
) If manufact				or is kno	wn (kWh	n/day):				1.	63		(-
emperature fa										0	.6		(4
nergy lost fro		_	-		:-		(48) x (49)) =		0.	.98		(
) If manufact ot water stora			-								0		(!
community h	•			- (,,	.,,					<u> </u>		(
olume factor	_										0		(
emperature fa	actor fro	m Table	2b								0		(
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(
nter (50) or (54) in (5	55)								0.	.98		(
ater storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
30.32	27.38	30.32	29.34	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(
	dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	ix H	
cylinder contains			20.24	30.32	29.34	30.32	30.32	29.34	30.32	29.34	30.32		(!
	27.38	30.32	29.34	30.32									(
<i>'</i>							•	-			0		(5
7)m= 30.32 rimary circuit	loss (an	nual) fro	m Table	3		(58) ÷ 36	65 × (41)	ım			0		
)m= 30.32	loss (an loss cal	nual) fro	m Table for each	3 month (59)m = (. ,	, ,		r thermo		0		

Combi loss	Combi loss calculated for each month (61)m = (60) \div 365 × (41)m													
$\begin{array}{c c} \text{Combinoss o} \\ \text{(61)m=} & 0 \end{array}$	balculated 0	or each	0	0	(6U) ÷ 30	05 × (41))m 0	0	0	Ιο	0]	(61)	
	_!		<u> </u>	<u> </u>			<u> </u>	ļ	<u> </u>	ļ	<u> </u>	(50)m + (61)m	(01)	
(62)m= 177.1		165.09	149.07	146.86	132.35	128.17	139.17	138.47	154.52	162.04	173.23	(59)m + (61)m	(62)	
Solar DHW input										ļ			(02)	
(add addition									ii contribu	ion to wate	or ricating)			
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)	
Output from	water hea	ter					<u> </u>					l		
(64)m= 177.1		165.09	149.07	146.86	132.35	128.17	139.17	138.47	154.52	162.04	173.23			
		•				•	Out	put from w	ater heate	r (annual) ₁	I12	1822.56	(64)	
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	-	
(65)m= 83.98	1	79.94	73.81	73.88	68.25	67.67	71.32	70.28	76.43	78.12	82.65	_	(65)	
include (5	7)m in cal	culation (of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating		
5. Internal	<u> </u>				•						•			
Metabolic ga														
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(66)m= 87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45		(66)	
Ligh <mark>ting g</mark> air	ns (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5						
(67)m= 14.3°	1 12.71	10.33	7.82	5.85	4.94	5.34	6.93	9.31	11.82	13.79	14.7		(67)	
App <mark>liance</mark> s (gains (ca <mark>lc</mark>	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5					
(68)m= 152.4	3 154.01	150.02	141.54	130.83	120.76	114.03	112.45	116.44	124.92	135.63	145.7		(68)	
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)), also s	ee Table	5					
(69)m= 31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75		(69)	
Pumps and	fans gains	(Table 5	 ба)							-		•		
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)	
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)				-	-	-	•		
(71)m= -69.9	6 -69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96		(71)	
Water heating	ng gains (1	Table 5)	-	-			-	-						
(72)m= 112.8	3 111.08	107.45	102.51	99.3	94.79	90.95	95.87	97.61	102.72	108.5	111.09		(72)	
Total intern	al gains =	•			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m			
(73)m= 328.8	327.03	317.04	301.1	285.21	269.72	259.55	264.49	272.59	288.7	307.16	320.73		(73)	
6. Solar ga	ins:													
Solar gains ar		Ü	r flux from	Table 6a			itions to c	onvert to th	ne applical		tion.			
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a	_	g_ Fable 6b	т	FF able 6c		Gains		
•			111-			DIE Ga	. –	able ob	_ '	able oc		(W)	,	
South 0.9		X	2.	6	X 2	16.75	X	0.53	X	0.7	=	12.18	(78)	
South 0.9		X	2.	6	X 7	76.57	X	0.53	X	0.7	=	19.94	(78)	
South 0.9		X	2.	6	x 9	97.53	×	0.53	X	0.7	=	25.4	(78)	
South 0.9		X	2.	6	x 1	10.23	x	0.53	x	0.7	=	28.71	(78)	
South 0.9	v 0.3	X	2.	6	x 1	14.87	X	0.53	Х	0.7	=	29.92	(78)	

South 0	.9x	0.3	7 x	2.6		x [110.55	;]	x	0.53	×	0.7		28.79	(78)
South 0		0.3	d x	2.6		x [108.01	_	x	0.53	×	0.7	= =	28.13	(78)
South 0	.9x	0.3	x	2.6		x	104.89)	х	0.53	x	0.7	=	27.32	(78)
South 0	.9x	0.3	X	2.6		x	101.89)	х	0.53	x	0.7	=	26.54	(78)
South 0	.9x	0.3	i x	2.6		x	82.59		х	0.53	x	0.7	=	21.51	(78)
South 0	.9x	0.3	X	2.6		х	55.42		x	0.53	x	0.7	-	14.43	(78)
South 0	.9x	0.3	i x	2.6		х	40.4		x	0.53	x	0.7		10.52	(78)
Southwest ₀	.9x	0.3	X	2.4		х	36.79			0.53	x	0.7	=	8.85	(79)
Southwest ₀	.9x	0.3	X	2.4		х	62.67			0.53	x	0.7	<u> </u>	15.07	(79)
Southwest ₀	.9x	0.3	X	2.4		x	85.75			0.53	x	0.7	=	20.62	(79)
Southwest ₀	.9x	0.3	X	2.4		x	106.25	5		0.53	x	0.7	=	25.54	(79)
Southwest ₀	.9x	0.3	X	2.4		x	119.01			0.53	X	0.7	=	28.61	(79)
Southwest ₀	.9x	0.3	X	2.4		x	118.15	5		0.53	X	0.7	=	28.4	(79)
Southwest ₀	.9x	0.3	X	2.4		x	113.91			0.53	X	0.7	=	27.38	(79)
Southwest ₀	.9x	0.3	X	2.4		x	104.39)		0.53	X	0.7	=	25.1	(79)
Southwest ₀	.9x	0.3	X	2.4		x	92.85			0.53	X	0.7	=	22.32	(79)
Southwest ₀	.9x	0.3	X	2.4		x	69.27			0.53	X	0.7	=	16.65	(79)
Southwest ₀	.9x	0.3	X	2.4		x [44.07			0.53	X	0.7	=	10.59	(79)
Southwest ₀	.9x	0.3	X	2.4		Х	31.49			0.53	X	0.7	=	7.57	(79)
West 0	.9x	0.3	×	2.6		х	19.64		×	0.53	x	0.7	=	5.12	(80)
West 0	.9x	0.3	X	2.6		X	38.42		X	0.53	X	0.7	=	10.01	(80)
West 0	.9x	0.3	X	2.6		x [63.27		Х	0.53	X	0.7	=	16.48	(80)
	.9x	0.3	X	2.6		X	92.28		х	0.53	X	0.7	=	24.03	(80)
	.9x	0.3	X	2.6		Х	113.09		X	0.53	Х	0.7	=	29.45	(80)
	.9x	0.3	X	2.6		X	115.77		X	0.53	X	0.7	=	30.15	(80)
		0.3	X	2.6		X	110.22	2	X	0.53	X	0.7	=	28.71	(80)
		0.3	X	2.6		X	94.68		X	0.53	X	0.7	=	24.66	(80)
		0.3	X	2.6		X	73.59		X	0.53	X	0.7	=	19.17	(80)
		0.3	X	2.6		X	45.59		X	0.53	X	0.7	=	11.87	(80)
		0.3	X	2.6	==	X	24.49		X	0.53	X	0.7	=	6.38	(80)
West 0	.9x	0.3	X	2.6		X	16.15		X	0.53	X	0.7	=	4.21	(80)
0.1				,					()	0 (7.1)	(22)				
Solar gains (83)m= 26			11ated 2.5	78.29	87.98	$\overline{}$	7.35 84	.22	(83)m 77.0	$\frac{1 = Sum(74)m}{07 \qquad 68.02}$	(82)m 50.03	i	22.3	1	(83)
Total gains										00.02	1 00.00	7 01.41		J	(/
(84)m= 354			9.54	379.39	373.19	·		3.77	341	.56 340.62	338.7	4 338.57	343.03]	(84)
7. Mean i	nternal t	emnera	ature	(heating	seasor	n)								J	
Temperat							area from	Tab	ole 9.	Th1 (°C)				21	(85)
Utilisation		•	•			_			,	(- /					` ′
		<u> </u>	Mar	Apr	May	Ť		ul	Αι	ug Sep	Oct	Nov	Dec]	
(86)m=	0.9	9 0	.99	0.96	0.89	0	.72 0.	53	0.5		0.96	0.99	1	1	(86)
						•				-	-	-		-	
—— Mean inte	I	peratu	re in l	living are	a T1 (f	ollo	w steps 3	to 7	' in T	able 9c)					
Mean inte	rnal tem	 	re in l	iving are	a T1 (f	_	i	to 7	in T		20.77	20.49	20.26]	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 20.21 20.22 20.22 20.23 20.23 20.25 20.25 20.25 20.24 20.23 20.23 20.22		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.99 0.99 0.98 0.95 0.86 0.65 0.44 0.47 0.73 0.94 0.99 1		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 19.24 19.37 19.58 19.88 20.11 20.23 20.25 20.25 20.21 19.97 19.58 19.23		(90)
fLA = Living area ÷ (4) =	0.56	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		
(92)m= 19.82 19.92 20.1 20.34 20.54 20.65 20.67 20.67 20.63 20.42 20.09 19.81		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 19.82 19.92 20.1 20.34 20.54 20.65 20.67 20.67 20.63 20.42 20.09 19.81		(93)
8. Space heating requirement	late	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calcuthe utilisation factor for gains using Table 9a	liate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.99 0.99 0.98 0.95 0.87 0.69 0.49 0.52 0.76 0.94 0.99 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m		(05)
(95)m= 352.45 368.02 371.86 361.16 326.4 246.21 170.12 177.59 260.25 319.17 333.58 341.05		(95)
Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		()
(97)m= 682.91 658.75 594.26 491.21 378.19 254.23 170.9 178.67 276.35 419.95 559.78 677.24		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		
(98)m= 245.86 195.37 165.46 93.63 38.54 0 0 0 74.98 162.86 250.13		
Total per year (kWh/year) = Sum(98) _{15,912} =	1226.84	(98)
Space heating requirement in kWh/m²/year	23.59	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.		7,000
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	11	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.25	(306)
Space heating	kWh/yeaı	
Annual space heating requirement	1226.84	
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1533.55	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308
_		

Space heating requirement from second	dary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				1822.56	7
If DHW from community scheme: Water heat from Community heat pump)	(64) x (303a) x	(305) x (306) =	2278.2	☐ (310a)
Electricity used for heat distribution		, , , , ,	7e) + (310a)(310e)] =	38.12](313)
Cooling System Energy Efficiency Ratio)			0](314)
Space cooling (if there is a fixed cooling		= (107) ÷ (314)	· =	0](315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra	velling (Table 4f):	tside		135.44] (330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	r	=(330a) + (330	b) + (330g) =	135.44	(331)
Energy for lighting (calculated in Appen	dix L)			252.67	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-337.57	(333)
Electricity generated by wind turbine (A	ppendix M) (negative quant	tity)		0	(334)
12b. CO2 Emissions – Community hear	ting scheme				
CO2 from other sources of space and v	vater heating (not CHP)	Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO <mark>2/yea</mark> r	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		kWh/year		kg CO <mark>2/yea</mark> r	(367a)
	If there is CHP using tw	kWh/year	kg CO2/kWh	kg CO2/year](367a)](367)
Efficiency of heat source 1 (%)	If there is CHP using tw	kWh/year o fuels repeat (363) to	kg CO2/kWh (366) for the second fuel	kg CO2/year	_
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using tw [(307b)+(310	kWh/year To fuels repeat (363) to (367b) x	(366) for the second fuel 0.52 = 0.52 =	319 620.16	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	[(307b)+(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)] [(310)]	kWh/year o fuels repeat (363) to ob)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(373)	(366) for the second fuel 0.52 = 0.52 =	319 620.16 19.78	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	[(307b)+(310)] [(317b)+(310)] [(317b	kWh/year o fuels repeat (363) to ob)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(373)	(366) for the second fuel 0.52 = 0.52 = 2) =	319 620.16 19.78 639.94	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	If there is CHP using tw [(307b)+(310) [(311) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312	kWh/year o fuels repeat (363) to ob)] x 100 ÷ (367b) x 3) x 3)(366) + (368)(373)	(366) for the second fuel 0.52 = 0.52 = 0.52 = 0 =	319 620.16 19.78 639.94	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (see	If there is CHP using tw [(307b)+(310) [(311) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312	kWh/year To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (363) to (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuels repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To fuel repeat (367b) x To	(366) for the second fuel 0.52 = 0.52 = 0.52 = 0 =	319 620.16 19.78 639.94 0	(367) (372) (373) (374) (375)
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Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (se CO2 associated with water from immers Total CO2 associated with space and w CO2 associated with electricity for pum	If there is CHP using tw [(307b)+(310) [(311) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312) [(312	kWh/year To fuels repeat (363) to [367b] x 100 ÷ (367b) x 3) x 3)(366) + (368)(373) 9) x s heater (312) x 3) + (374) + (375) = (331)) x 2))) x	(366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	319 620.16 19.78 639.94 0 639.94 70.3	(367) (372) (373) (374) (375) (376) (378)
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Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immersorated CO2 associated with space and work CO2 associated with electricity for pum CO2 associated with electricity for lighting Energy saving/generation technologies litem 1	If there is CHP using tw [(307b)+(310) [(311) [(312) [(313) [(313) [(314) [(307b)+(310) [(314) [(307b)+(310) [(314) [(307b)+(310) [(315) [(316) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317) [(317)	kWh/year To fuels repeat (363) to [367b] x 100 ÷ (367b) x 3) x 3)(366) + (368)(373) 9) x s heater (312) x 3) + (374) + (375) = (331)) x 2))) x	kg CO2/kWh (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	319 620.16 19.78 639.94 0 639.94 70.3 131.14	(367) (372) (373) (374) (375) (376) (378) (379) (380)

		User D	etails:										
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa				Versio	on: 1.0.4.26					
		Property .	Address:	B79_B	e Green								
Address :	The Charlie Ratchford Ce	ntre, Belm	ont Stree	et, LONE	OON, NV	V1 8HF							
1. Overall dwelling dimensions: Area(m²) Av. Height(m)													
0		Area					1 , 1	Volume(m³)	_				
Ground floor			52	(1a) x	2	2.8	(2a) =	145.6	(3a)				
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+((1n)	52	(4)									
Dwelling volume				(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	145.6	(5)				
2. Ventilation rate:													
	main second heating heatin		other		total			m³ per hou	r				
Number of chimneys			0	=	0	X 4	40 =	0	(6a)				
Number of open flues	0 + 0	= +	0] = [0	x 2	20 =	0	(6b)				
Number of intermittent far	ns			, 	2	x -	10 =	20	(7a)				
Number of passive vents				Ē	0	x ·	10 =	0	(7b)				
Number of flueless gas fir	res			Ī	0	X 4	40 =	0	(7c)				
				_			Air ob	anges ner he					
	(0.40)			_				anges per ho	_				
	vs, flues and fans = (6a)+(6b) een carried out or is intended, proc			ontinuo fr	20		÷ (5) =	0.14	(8)				
Number of storeys in th		eed to (17), (ourerwise c	Onunue III	om (9) to (10)		0	(9)				
Additional infiltration	C all claiming (i.i.e)					[(9)	-1]x0.1 =	0	(10)				
Structural infiltration: 0.	25 for steel or timber frame	or 0.35 fo	r masonr	y constr	uction			0	(11)				
	esent, use the value corresponding	g to the great	er wall are	a (after			l		_				
deducting areas of openin	_{lgs);} if equal user 0.35 loor, enter 0.2 (unsealed) or	· 0 1 (soale	ad) alsa	ontor O					(12)				
If no draught lobby, ent		U.T (Scale	ou), 6136	eriter o				0	(13)				
•	and doors draught stripped	1						0	(14)				
Window infiltration	and doors and grit surppos		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)				
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)				
Air permeability value,	q50, expressed in cubic me	tres per ho	our per so	quare m	etre of e	nvelope	area	5	(17)				
If based on air permeabili	ty value, then $(18) = [(17) \div 20]$]+(8), otherw	ise (18) = (16)				0.39	(18)				
	s if a pressurisation test has been o	done or a de	gree air pei	meability	is being u	sed			_				
Number of sides sheltered Shelter factor	d		(20) = 1 -	0 075 v (1	Q)1 —			2	(19)				
Infiltration rate incorporati	ing chalter factor		(21) = (18)	•	O)] =			0.85	(20)				
Infiltration rate modified for	•		(21) - (10)	X (20) =				0.33	(21)				
	Mar Apr May Jur	n Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind spe			5			<u> </u>							
	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7						
			1		l	I	ı	I					
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18						
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	ı	1.08	1.12	1.18						

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.42	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.39]	
Calculate effec		_	rate for t	he appli	cable ca	se	l				!	, 	
If mechanica			l' N (0	01) (00	\ .	(1	15// (1	. (00)	\ (00 \			0	(23
If exhaust air he) = (23a)			0	(23
If balanced with		•	-	_								0	(23
a) If balance		i				<u> </u>	- 	ŕ	, 	- 	1 ` '	i ÷ 100] 1	(0
(24a)m= 0		0	0	0	0	0	0	0	0	0	0	J	(24
b) If balance							r ``	í `	r ´ `			1	(2)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24
c) If whole he if (22b)m				-					5 × (23b)	_		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v if (22b)m				•	•				0.5]				
(24d)m= 0.59	0.58	0.58	0.57	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57]	(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)	-	-			
(25)m= 0.59	0.58	0.58	0.57	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(2
3. Heat losses	s and he	eat loss	paramete	er:							_	_	_
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value		A X k kJ/K
Doo <mark>rs Ty</mark> pe 1					2.4	×	1.2	=	2.88				(26
Doo <mark>rs Ty</mark> pe 2					2.5	x	1.2	=	3	Ħ			(26
Windows Type	1				2.4	x1.	/[1/(1.4)+	0.04] =	3.18	Ħ			(27
Windows Type	2				2.6	x ₁ ,	/[1/(1.4)+	0.04] =	3.45	5			(27
Windows Type	3				2.6	x ₁ ,	/[1/(1.4)+	0.04] =	3.45	Ħ			(27
Walls Type1	33.3	32	12.5		20.82	<u> </u>	0.18	i	3.75	Ħ ſ			(29
Walls Type2	11.4		0	=	11.48	=	0.18	=	2.07	≓ i			(29
Roof	52			=	52	x	0.13		6.76	=		-	(30
Total area of e					96.8	=	0.10		0.10				(3.
* for windows and		•	ffective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	ı 3.2	(0
** include the area						_							
Fabric heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				28.5	3 (3:
Heat capacity (Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34
Thermal mass	parame	eter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
For design assess can be used instea				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	•	,		• .	•	<						4.84	(36
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			33.3	7 (37
Ventilation hea	t loss ca	alculated	l monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 28.26	28.09	27.93	27.18	27.03	26.37	26.37	26.25	26.63	27.03	27.32	27.62		(38
Heat transfer c	oefficier	nt, W/K					-	(39)m	= (37) + (38)m		-	
(39)m= 61.63	61.46	61.3	60.55	60.4	59.74	59.74	59.62	60	60.4	60.69	60.99		
Stroma FSAP 201	2 Version:	: 1.0.4.26 (SAP 9.92)	- http://w	ww.stroma	.com	•	•	Average =	Sum(39) ₁	12 /12=	60.5	Page 2 of 34

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
0)m= 1.19	1.18	1.18	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.17	1.17		
umber of day	s in mor	oth (Tabl	le 1a)					,	Average =	Sum(40) ₁ .	12 /12=	1.16	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
4. Water heat	ing ener	gy requi	rement:								kWh/ye	ear:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		75		(42
nnual average educe the annua of more that 125	e hot wa I average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.74		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m= 83.31	80.28	77.26	74.23	71.2	68.17	68.17	71.2	74.23	77.26	80.28	83.31		_
nergy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600		Total = Su oth (see Ta	, ,		908.89	(44
5)m= 123.55	108.06	111.51	97.22	93.28	80.49	74.59	85.59	86.62	100.94	110.19	119.65		
-,									Total = Su			1191.69	(4
inst <mark>antane</mark> ous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)					_
6)m= 18.53	16.21	16.73	14.58	13.99	12.07	11.19	12.84	12.99	15.14	16.53	17.95		(46
/ater storage torage volum		includin	na anv so	olar or M	/WHRS	storage	within sa	me ves	امء		150		(4
community h	,										130		(4)
therwise if no	•			_			. ,	ers) ente	er '0' in (47)			
/ater storage													
i) If manufacti				or is kno	wn (kWh	n/day):				1.	39		(4
emperature fa										0.	54		(4
nergy lost fro		•			:-		(48) x (49)	=		0.	75		(5
) If manufactor ot water stora 			-								0		(5
community h	-			• (,,					<u> </u>		(-
olume factor	from Tal	ble 2a									0		(5
emperature fa	actor fro	m Table	2b								0		(5
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(5
Inter (50) or (54) in (5	55)								0.	75		(5
ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)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		(5
cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	x H	
7)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		(5
rimary circuit	loss (an	nual) fro	m Table	3	<u> </u>	<u> </u>	<u> </u>	<u> </u>			0		(5
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
			–	`				مالد مالد م		-4-4\			
(modified by	tactor fr	om Labi	e H5 if t	here is s	solar wat	er neatii	ng and a	cylinae	r tnermo	stat)			

Combi loss (Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m													
(61)m= 0	0 0	0	0	0 0	00) + 30	05 x (41)	0	T 0	0	0	0	1	(61)	
			<u> </u>	<u> </u>								J · (59)m + (61)m	` /	
(62)m= 170.1	-	158.1	142.31	139.88	125.59	121.18	132.19		147.54	155.28	166.25]	(62)	
Solar DHW inpu		using App	L endix G oı	r Appendix	H (negati	ve quantity	y) (enter	U'o' if no sola	r contribut	tion to wate	r heating)]		
(add addition											-			
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)	
Output from	water hea	ter						-				•		
(64)m= 170.1	5 150.15	158.1	142.31	139.88	125.59	121.18	132.19	131.71	147.54	155.28	166.25		_	
							Ou	tput from w	ater heate	r (annual)	12	1740.31	(64)	
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	<u>[</u>]		
(65)m= 78.36	69.6	74.35	68.4	68.29	62.84	62.08	65.74	64.87	70.84	72.71	77.06		(65)	
include (5	7)m in cald	culation	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating		
5. Internal	gains (see	Table 5	and 5a):										
Metabolic ga	ins (Table	5), Wat	ts			1	,		,		1	1		
Jan	Feb Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_		
(66)m= 87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45	87.45		(66)	
Ligh <mark>ting gair</mark>		ted in Ap	_			r L9a), a		Table 5				,		
(67)m= 14.31	12.71	10.33	7.82	5.85	4.94	5.34	6.93	9.31	11.82	13.79	14.7		(67)	
App <mark>liance</mark> s g	,	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			_		
(68)m= 152.4	3 154.01	150.02	141.54	130.83	120.76	114.03	112.45	116.44	124.92	135.63	145.7		(68)	
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also s	see Table	5			_		
(69)m= 31.75	31.75	31.75	31. <mark>75</mark>	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75		(69)	
Pumps and f	fans gains	(Table 5	5a)			1					1	7		
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)	
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	T	,		T	т	T	7		
(71)m= -69.9		-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	-69.96	J	(71)	
Water heating		able 5)		,		,	,		,			-		
(72)m= 105.3	2 103.57	99.94	95	91.79	87.27	83.44	88.35	90.1	95.21	100.99	103.58]	(72)	
Total intern	_ _							+ (69)m +	· · · · · ·			1		
(73)m= 324.2		312.53	296.59	280.7	265.21	255.04	259.98	268.08	284.19	302.65	316.22	<u> </u>	(73)	
6. Solar gai			fl f	Table Ca		:				-1	.:			
Solar gains ar Orientation:		Ü	Area		and assoc Flu		itions to (ie applicai	ole oriental	iion.	Gains		
Onemation.	Table 6d		Mea m ²			ble 6a		g_ Table 6b	Т	able 6c		(W)		
South 0.9	0.3	×	2.	6	x 4	16.75] _x [0.63	x	0.7		14.47	(78)	
South 0.93		x	2.	==		76.57] ^ <u> </u>] _x [0.63	^ x	0.7	-	23.7](78)	
South 0.93		^ ^	2.			97.53] ^ <u> </u>] _x [0.63	^	0.7	-	30.19](78)	
South 0.9		^ ^	2.			10.23	」^ <u>∟</u>]	0.63	^	0.7		34.13](78)	
South 0.93		^ ^	2.		<u> </u>	14.87	」^ <u>∟</u>]	0.63	^	0.7		35.56](78)	
2.2 0.3/	0.3	^ ^		<u> </u>	^	14.07	」^∟	0.03	^ L	0.7		33.30	J(, 0)	

South 0.9x								1 1						(70)
	0.3	X	2.0		X	_	10.55	X	0.63	×	0.7	=	34.22	(78)
South 0.9x South 0.9x	0.3	X	2.0		X		08.01	X	0.63	×	0.7	=		(78)
- · · · · · · · · · · · · · · · · · · ·	0.3	X	2.0		X		04.89	X	0.63	×	0.7	=	32.47	(78)
South 0.9x	0.3	X	2.6	5	X	10	01.89	X	0.63	×	0.7	=	31.54	(78)
South 0.9x	0.3	X	2.0	3	X	8	2.59	X	0.63	×	0.7	=	25.57	(78)
South 0.9x	0.3	X	2.6	5	X	5	5.42	X	0.63	X	0.7	=	17.16	(78)
South 0.9x	0.3	X	2.0	3	X		10.4	X	0.63	X	0.7	=	12.51	(78)
Southwest _{0.9x}	0.3	X	2.4	4	X	3	6.79		0.63	X	0.7	=	10.51	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	6	2.67		0.63	X	0.7	=	17.91	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	8	5.75		0.63	X	0.7	=	24.51	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	10	06.25		0.63	X	0.7	=	30.36	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	1	19.01		0.63	X	0.7	=	34.01	(79)
Southwest _{0.9x}	0.3	X	2.4	4	x	1	18.15]	0.63	X	0.7	=	33.76	(79)
Southwest _{0.9x}	0.3	X	2.4	4	X	1	13.91		0.63	X	0.7	=	32.55	(79)
Southwest _{0.9x}	0.3	X	2.4	4	x	10	04.39		0.63	X	0.7	=	29.83	(79)
Southwest _{0.9x}	0.3	x	2.4	4	x	9	2.85		0.63	x	0.7	=	26.53	(79)
Southwest _{0.9x}	0.3	X	2.4	4	x	6	9.27		0.63	x	0.7	=	19.79	(79)
Southwest _{0.9x}	0.3	х	2.4	4	X	4	4.07		0.63	Х	0.7	=	12.59	(79)
Southwest _{0.9x}	0.3	x	2.4	4	x	3	1.49	i	0.63	Х	0.7	_	9	(79)
West 0.9x	0.3	x	2.6	5	x	1	9.64	x	0.63	X	0.7	=	6.08	(80)
West 0.9x	0.3	x	2.6	6	x	3	8.42	x	0.63	X	0.7	=	11.89	(80)
West 0.9x	0.3	x	2.6	5	X	6	3.27	Х	0.63	x	0.7	<u> </u>	19.59	(80)
West 0.9x	0.3	X	2.0	5	X	9	2.28	X	0.63	X	0.7	-	28.57	(80)
West 0.9x	0.3	X	2.0	3	х	1/	13.09	X	0.63	x	0.7		35.01	(80)
West 0.9x	0.3	X	2.0	3	x	1	15.77	X	0.63	×	0.7		35.84	(80)
West 0.9x	0.3	X	2.0	3	x	1	10.22	X	0.63	x	0.7	=	34.12	(80)
West 0.9x	0.3	X	2.0	3	x	9	4.68	X	0.63	x	0.7	=	29.31	(80)
West 0.9x	0.3	X	2.0	3	x	7	3.59	X	0.63	x	0.7	=	22.78	(80)
West 0.9x	0.3	X	2.0		x		5.59	X	0.63	x	0.7	=	14.11	(80)
West 0.9x	0.3	X	2.0	5	x	_	4.49	X	0.63	x	0.7		7.58	(80)
West 0.9x	0.3	X	2.0		x		6.15	X	0.63	×	0.7			(80)
L								J						``
Solar gains in v	vatts, ca	alculated	I for eacl	n mont	h			(83)m	= Sum(74)n	n(82)r	n			
(83)m= 31.07	53.51	74.29	93.06	104.58	$\overline{}$	03.83	100.11	91.	61 80.86	59.4	8 37.33	26.5		(83)
Total gains – in	ternal a	nd solar	(84)m =	(73)m	+ (83)m	, watts		•	•	•	•	_	
(84)m= 355.36	376.03	386.82	389.65	385.28	3	69.03	355.15	351	.59 348.94	4 343.	339.98	342.72		(84)
7. Mean intern	al temp	erature	(heating	seaso	n)									
Temperature of			`			area 1	rom Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fact	or for ga	ains for	living are	ea, h1,r	n (s	ee Ta	ble 9a)							
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	A	ug Sep	00	t Nov	Dec		
(86)m= 1	0.99	0.99	0.98	0.95	+	0.85	0.69	0.7	-	0.98	0.99	1		(86)
Mean internal	temper	ature in	living ar		follo	w ste	ns 3 to 7	7 in T	able 9c)				<u> </u>	
(87)m= 19.79	19.89	20.09	20.37	20.64	_	20.87	20.97	20.		20.4	7 20.09	19.77		(87)
			<u> </u>										_	

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Tomporatura duri	a booting r	aariada ir	root of	duallina	from To	bla O T	ha (°C\					
Temperature durir (88)m= 19.93 19.93	 	19.95	19.95	19.96	19.96	19.96	<u> </u>	19.95	19.95	19.94		(88)
` '		ļ.		<u> </u>		ļ	19.96	19.95	19.95	19.94		(00)
Utilisation factor for (89) m= 1 0.9	-	0.97	welling, 0.92	n2,m (se	0.55	9a) 0.58	0.84	0.97	0.99	1		(89)
· · L		!		<u> </u>		<u> </u>	<u> </u>	<u> </u>	0.00	'		()
Mean internal tem (90)m= 18.33 18.	1	19.18	of dwelli 19.57	ng 12 (f	19.95	19.94	7 IN Tabl	e 9c) 19.34	18.78	18.31		(90)
10.00	0 10.77	10.10	10.07	10.07	10.00	10.04	<u> </u>	!	g area ÷ (4		0.56	(91)
				\		<i>(</i>			`	′ l	0.00	(0.)
Mean internal tem (92)m= 19.15 19.1	`	1			1		·	40.07	40.54	40.40		(92)
(92)m= 19.15 19.1 Apply adjustment		19.85	20.17	20.43	20.52	20.51	20.37	19.97	19.51	19.13		(92)
(93)m= 19.15 19.1		19.85	20.17	20.43	20.52	20.51	20.37	19.97	19.51	19.13		(93)
8. Space heating			20111	201.10	20.02	20.01	20.01	10.01	10.01	101.10		(11)
Set Ti to the mear	·		re obtain	ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation factor	r for gains	using Ta	ble 9a			ī						
Jan Fe		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor fo	-	1										(0.4)
(94)m= 0.99 0.9		0.97	0.93	0.81	0.63	0.66	0.86	0.97	0.99	1		(94)
Useful gains, hm (95)m= 353.25 372		4)m x (84 377.74	4)m 357	298.67	223.52	231.67	301.29	331.87	336.37	341.02		(95)
Monthly average					223.32	231.07	301.29	331.07	330.37	341.02		(00)
(96)m= 4.3 4.9		8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for												, ,
(97)m= 915.09 883		662.82	511.85	348.45	234.22	245.32	376.26	566.24	753.44	910.67		(97)
Space heating rec	uirement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	1)m			
(98)m= 418.01 343	32 310	205.26	115.21	0	0	0	0	174.37	300.3	423.82		
				-		Tota	l per year	(kWh/year	·) = Sum(9	8) _{15,912} =	2290.29	(98)
Space heating red	uirement ir	n kWh/m²	/year								44.04	(99)
9a. Energy require	nents – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)			ı		
Space heating:							,					
Fraction of space	neat from s	econdar	y/supple	mentary	system						0	(201)
Fraction of space	neat from r	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of total he	ating from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		Ī	1	(204)
Efficiency of main	space hea	ting syste	em 1							Ī	93.5	(206)
Efficiency of secon	dary/supp	lementar	y heating	g systen	า, %					Ì	0	(208)
Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	- ⊐ ear
Space heating red		<u> </u>		L	!		<u>'</u>	ļ.	<u>I</u>		,	
418.01 343	32 310	205.26	115.21	0	0	0	0	174.37	300.3	423.82		
(211) m = {[(98)m x	(204)] } x	100 ÷ (20	06)	_								(211)
447.07 367	18 331.55	219.53	123.22	0	0	0	0	186.5	321.17	453.29		
	•			•		Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	2449.51	(211)
Space heating fue	(seconda	ry), kWh/	month							•		_
= {[(98)m x (201)] }		T .		ı		ı	1	ı	ı			
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		_
						1018	ıl (kWh/yea	ar) =5um(2	د انگا _{15,1012}	F	0	(215)

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25.59 121.18	132.19	131.71	147.54	155.28	166.25		
!	1	l	l	<u> </u>	l	79.8	(216)
79.8 79.8	79.8	79.8	85.26	86.54	87.21		(217)
•						•	
57.38 151.86	165.65	165.05	173.04	179.42	190.64		
	Tota	l = Sum(2	19a) ₁₁₂ =			2065.42	(219)
			k\	Wh/year	•	kWh/yea	
						2449.51	
						2065.42	
					30		(230
					45		(230
	sum	of (230a).	(230g) =			75	(231)
						252.67	(232)
s including m	icro-CHF						
Energy			Emiss	ion fac	tor	Emissions	•
(211) x			0.2	16	=	529.09	(261)
(215) x			0.5	19	=	0	(263)
(219) x			0.2	16	=	446.13	(264)
(261) + (262)	+ (263) + ((264) =				975.23	(265)
(231) x			0.5	19	=	38.93	(267)
(232) x			0.5	19	=	131.14	(268)
	79.8 79.8 57.38 151.86 57.38 151.86 Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	79.8 79.8 79.8 57.38 151.86 165.65 Tota sum s including micro-CHF Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (263) + (261) x	79.8 79.8 79.8 79.8 57.38 151.86 165.65 165.05 Total = Sum(2 sum of (230a). s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	79.8 79.8 79.8 79.8 85.26 57.38 151.86 165.65 165.05 173.04 Total = Sum(219a) ₁₁₂ = k1 sum of (230a)(230g) = s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x (263) x (263) x (264) x (265) x (265) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266) x (266)	79.8 79.8 79.8 79.8 85.26 86.54 57.38 151.86 165.65 165.05 173.04 179.42 Total = Sum(219a) ₁₁₂ = kWh/year s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x 0.519	79.8 79.8 79.8 79.8 85.26 86.54 87.21 57.38 151.86 165.65 165.05 173.04 179.42 190.64 Total = Sum(219a),2 = kWh/year 30 45 sum of (230a)(230g) = s including micro-CHP Energy kWh/year (211) x (211) x (215) x (219) x (219) x (261) + (262) + (263) + (264) = (231) x (231) x (231) x (262) + (263) + (264) = (231) x (263) + (264) = (231) x	79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.9 75.23 75.23 76.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 77.20 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8 79.8

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A3. CORRESPONDENCE

Grace Wileman

Subject:

FW: Redevelopment of the Charlie Ratchford resource centre

From: Davies, James < <u>James.Davies@camden.gov.uk</u>>

Sent: 13 December 2018 15:57

To: Dan Jestico < DJestico@iceniprojects.com >; Berry-Khan, Gabriel < Gabriel.Berry-Khan@camden.gov.uk >

Cc: Thuaire, Charles < Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles <a href="mailto:Charles

< KHodgson@iceniprojects.com >; Mairead Flower < mflower@iceniprojects.com >

Subject: RE: Redevelopment of the Charlie Ratchford resource centre

Hi Dan,

We've just launched our new website and so the link is clearly suffering from a few teething issues.

On the viability of a Kentish Town Network, I can confirm that at present there are no detailed plans for a network which the redevelopment of the Charlie Ratchford site would be able to connect to. The area is of interest, particularly with the density of Camden housing to the north of the development (Denton, St Silas and New Harmood Estates), so it would be prudent and recommended via policy to future proof the development for connection.

I hope that helps, let me know if you need any more information.

Many thanks,

James

James Davies Senior Sustainability Officer (Low Carbon)

Telephone: 020 7974 6892



From: Dan Jestico <DJestico@iceniprojects.com>

Sent: 13 December 2018 15:32

To: Berry-Khan, Gabriel <<u>Gabriel.Berry-Khan@camden.gov.uk</u>>; Davies, James <<u>James.Davies@camden.gov.uk</u>> **Cc:** Thuaire, Charles <<u>Charles.Thuaire@camden.gov.uk</u>>; Nick Grant <<u>NGrant@iceniprojects.com</u>>; Kieron Hodgson KHodgson@iceniprojects.com>; Mairead Flower <mflower@iceniprojects.com>

Subject: RE: Redevelopment of the Charlie Ratchford resource centre

Dear Gabriel / James,

Many thanks for your prompt response - this is much appreciated. Unfortunately, I don't seem to be able to access the weblink below. Would you be able to email me the report directly?

If James is able to provide me with more detail on the Kentish Town West network, and the potential for connection to this, that would be very helpful.

Kind regards,

Dan.

Dan Jestico CEng MIMechE

Director, Sustainable Development

telephone: 020 3640 1031 **mobile**: 07584 886 068

email: DJestico@iceniprojects.com



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From: Berry-Khan, Gabriel <Gabriel.Berry-Khan@camden.gov.uk>

Sent: 13 December 2018 14:42

To: Dan Jestico <<u>DJestico@iceniprojects.com</u>>; Davies, James <<u>James.Davies@camden.gov.uk</u>>

Cc: Thuaire, Charles < Charles. Thuaire@camden.gov.uk >; Nick Grant < NGrant@iceniprojects.com >; Kieron Hodgson

<KHodgson@iceniprojects.com>; Mairead Flower <mflower@iceniprojects.com>

Subject: RE: Redevelopment of the Charlie Ratchford resource centre

Dear Dan

Many thanks for your approach and I am pleased to help direct you to more information.

In terms of DEN area studies and planning potential, applicants are advised always to consult the Borough Wide District Heat Mapping report: https://www.camden.gov.uk/ccm/cms-service/stream/asset?asset_id=3594902& in addition to the relevant DEN section within Camden Planning Guidance 3 'Sustainability' (CPG3). Note the criteria in the latter for making DEN contributions within a planning scheme.

The best colleague to speak to about the most recent DEN developments would be James Davies (cc), our Low Carbon and energy networks officer.

Best regards, Gabriel

Gabriel Berry-Khan Senior Sustainability Officer (Planning)

Telephone: 020 7974 4550



From: Dan Jestico <DJestico@iceniprojects.com>

Sent: 13 December 2018 12:44

To: Berry-Khan, Gabriel < Gabriel. Berry-Khan@camden.gov.uk >

Cc: Thuaire, Charles < Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles Charles <a href="mailto:Charles

<KHodgson@iceniprojects.com>; Mairead Flower <mflower@iceniprojects.com>

Subject: Redevelopment of the Charlie Ratchford resource centre

Dear Gabriel,

I hope you are well.

We are currently working on the redevelopment of the Charlie Ratchford resource centre. I am writing to enquire as to whether there are any planned or existing district heating networks in the vicinity of the site the scheme could be able to connect to. The GLA's London Heat map doesn't show anything nearby.

However, I understand that an assessment of a district heat network potential in Kentish Town West has recently been undertaken, and I was wondering if you might be able to provide me with details on where the network proposals are currently in terms of feasibility, delivery and capacity.

As you're no doubt aware, Policy CC1 sets out that the Council will promote decentralised energy by working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them. Specifically the policy requires all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

We are therefore very keen to engage with you at the early stages of the project to ensure we are in the best position to meeting both Camden and GLA policy objectives.

If you or your colleagues would like to meet to discuss the project and district heat network connection feasibility, please let me know.

Kind regards,

Dan.

Dan Jestico CEng MIMechEDirector, Sustainable Development

telephone: 020 3640 1031 **mobile:** 07584 886 068

email: DJestico@iceniprojects.com



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A4. RENEWABLE ENERGY FEASIBILITY ASSESSMENT

A4.1 In line with GLA London Plan requirements, a feasibility assessment of potential renewable energy technologies has been undertaken, and the results from this are presented below.

Technology	Appraisal	Included in
		Development?
Biomass	This technology is not considered a practical solution to reducing CO ₂ emissions, in the view of limited storage space for the combustible material, accessibility of the site for regular deliveries of the material, associated carbon emissions of this technology which are not normally accounted for within energy modelling, and local air quality issues arising from the combustion of biomass material.	*
Air source heat	This technology is deemed appropriate to provide both	
pump	space and water heating to the proposed dwellings. Full details of the proposed system efficiencies and associated carbon dioxide savings are provided in Section 4. More details on the proposed system are provided below.	
Ground source	This technology is not deemed appropriate as heat is	
heat pump	already due to be provided to the scheme by the proposed communal air source heat pump system.	×
Photovoltaics (PV)	As detailed above in Section 4, the use of PV panels is considered appropriate for this scheme, and its use has been maximised in accordance with the roof space available following the incorporation of roof plant associated with the proposed communal ASHP system. Full details of the proposed PV arrays, areas, locations, outputs and associated carbon dioxide savings are provided in Section 4.	

Solar thermal hot water (STHW)	Whilst technically feasible, this technology is rejected on the basis that hot water produced by STHW panels would compete with that provided by the proposed communal ASHP system. In addition, the STHW panels would also compete for roof space with the PV panels detailed above, which are considered to be a more appropriate usage of roof space. This technology is therefore rejected.	*
Wind turbines	This technology is rejected on the basis of its potential impact on visual amenity and relatively low efficiency from unpredictable, turbulent wind conditions in urban locations.	*

A4.2 Figure A4.1 below provides more details on the system performance and relevant certification, provided by the system manufacturer.

Figure A4.1 Manufacturer's performance specification of proposed ASHP system



Making a World of Difference

MODEL		CAHV-P500YA-HPB		
HEAT PUMP SPACE	ErP Rating	A++		
HEATER - 55°C	η,	125%		
	SCOP	3.19		
HEAT PUMP SPACE	ErP Rating	A+		
HEATER - 35°C	η,	139%		
	SCOP	3.54		
HEATING*1	Capacity (kW)	42.6		
(A-3/W35)	Power Input (kW)	15.2		
	COP	2.80		
OPERATING AMBIENT TEN	MPERATURE (°C DB)	-20~+40°C		
SOUND PRESSURE LEVEL	L AT 1M (dBA)*2*8	59		
LOW NOISE MODE (dBA)*2	2	Variable		
FLOW RATE(I/min)		126		
WATER PRESSURE DROP	(kPa)	18		
DIMENSIONS (mm)	Width	1978		
	Depth	759		
	Height	1710 (1650 without legs)		
WEIGHT (kg)	3	526		
ELECTRICAL SUPPLY		380-415v, 50Hz		
PHASE		3		
NOMINAL RUNNING CURI	RENT [MAX] (A)	17.6 [52.9]		
FUSE RATING - MCB SIZE	S (A)'4	63		

^{*1} Under normal heating conditions at outdoor temp: .9°CDB / .4°CWB, outlet water temp 36°C, inlet water temp 30°C
*2 Under normal heating conditions at outdoor temp; 7°CDB / 6°CWB, outlet water temp 36°C, inlet water temp 30°C as tested to BS EN14511
*3 Sound power level of the CAHN-PS00YA-HPB is 70.7°CBA. Tested to BS EN12102
*4 MCB Sizes BS EN408882 & BS EN40847-2
**Quality in the seasonal space heating energy efficiency (SSHEE)
**Quality in the seasonal space heating energy efficiency

A5. DOMESTIC OVERHEATING ASSESSMENT

Introduction

- A5.1 Policy 5.9 of the London Plan 'Overheating and Cooling' seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis.
- A5.2 In order to reduce overheating and reliance on air conditioning, the design of the proposed scheme at Belmont Street has followed the Cooling Hierarchy detailed in Policy 5.9:
 - 1. Minimise internal heat generation through energy efficient design;
 - 2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and walls;
 - 3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
 - 4. Passive ventilation;
 - 5. Mechanical ventilation;
 - Active cooling systems.

Cooling Hierarchy

A5.3 The methods used to minimise overheating and excessive heat generation in line with the cooling hierarchy are outlined below.

Minimisation of internal heat generation through energy efficient design

- Heat gain from lighting is kept to a minimum as a result of an energy-efficient lighting design solution.
- The availability of natural light is maximised by optimising the light transmittance of the glass elements of the façade.
- Heat distribution pipework in communal areas of the residential component will be designed to minimise heat loss.
- HIUs will be positioned in apartments adjacent to corridors and risers to minimise pipework runs within apartments.
- The scheme will use a communal air source heat pump, which is a low temperature distribution system, leading to lower internal heat gains from distribution pipework.

Reduction of the amount of heat entering the building in summer

- The building's facades have a limited amount of glazing to mitigate direct solar heat gain while optimising daylight penetration.
- Façade glazing will use solar control glass to reduce solar gains entering dwellings
- The use of inset balconies and blinds will provide solar shading to apartments, although the overheating mitigation strategy is not dependent on the use of blinds.

Management of the heat within the building through exposed thermal mass and high ceilings

 The proposed green roofs will have a high degree of in-built thermal mass to mitigate heat gain and heat loss.

Passive ventilation

- Openable windows on multiple aspects spaces will provide a passive ventilation strategy that
 utilises crossflow ventilation to maximise the potential for natural ventilation within the scheme.
- Single aspect dwellings will also have multiple openable windows throughout the façade to provide passive ventilation.

Mechanical and active cooling

Cooling is not proposed.

Overheating Criteria

- A5.4 TM59:2017 is a design methodology for the assessment of overheating risk in homes, published by the Chartered Institution of Building Services Engineers (CIBSE), in April 2017.
- A5.5 This is a standardised approach to predict overheating risk for residential building designs using dynamic thermal analysis. It provides a baseline which includes specific weather files, defined internal gains and a set of profiles that represent reasonable usage patterns for a home suitable for evaluating overheating risk. In addition, defined thresholds to provide a pass / fail result are clearly provided as detailed below.
- A5.6 Compliance is based on passing both of the following two criteria:
 - 1. For living rooms, kitchen and bedrooms: the number of hours during which the temperature difference between the inside and outside is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours.
 - 2. For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 22:00 to 07:00 shall not exceed 26 °C for more than 1% of annual hours.

(Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, therefore 33 or more hours above 26 °C will be recorded as a fail).

A5.7 Both criteria (1) and (2) above should be met for all relevant rooms.

Methodology

- A5.8 The TM59 methodology provides a baseline and guidance for a domestic overheating risk assessment. In line with this methodology, this section includes model inputs used to assess overheating risks to the proposed sample dwellings of the proposed development at Belmont Street.
- A5.9 Eight apartments were selected for this overheating risk assessment, which were deemed to be at the highest risk of overheating within the development.
 - Third floor. Dwelling C-108. Dual aspect apartment with large area of south facing glazing.
 - Fourth floor. Dwelling A-25. Triple aspect apartment with west facing bedroom and east facing living room.
 - Fourth floor. Dwelling B-58. Single aspect apartment with large area of south west facing glazing.
 - Fourth floor. Dwelling B-59. Single aspect apartment with large area of south west facing glazing.
 - Fourth floor. Dwelling C-109. Triple aspect apartment with west/east facing bedrooms and west facing living room.
 - Fourth floor. Dwelling C-110. Dual aspect studio apartment with large area of west facing glazing on living room, and limited open area on east façade.
 - Ninth floor Dwelling B-78. Dual aspect apartment with large area of south west facing glazing, and limited shading from above.
 - Ninth floor Dwelling B-79. Dual aspect apartment with large area of south west facing glazing, and limited shading from above.
- A5.10 The images below show the locations of the tested dwellings.

Figure A5.1 Locations of tested dwellings on the third floor

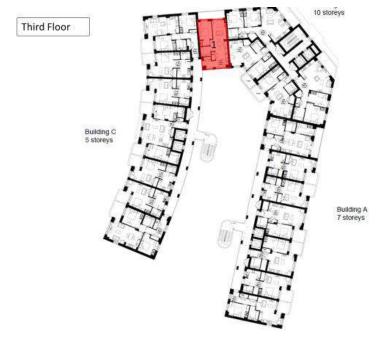


Figure A5.2 Locations of tested dwellings on the fourth floor





Figure A5.3 Locations of tested dwellings on the ninth floor

- A5.11 Dwellings 5, 6, 7 and 8 all have single aspect orientation, all facing south west.
- A5.12 All other dwellings are dual or triple aspect.
- A5.13 The model was created in EDSL TAS to simulate the internal conditions in each of the occupied spaces highlighted in the above images. The geometry was modelled based on planning submission Issue drawings from HTA Architects.
- A5.14 The weather files used for simulation have been based on the guidance contained within CIBSE TM49:2014 (Design Summer Years for London) as follows:
 - Design summer year weather file for London Weather Centre, based on an urban location for 1989 (DSY1), has been used on the simulations as required by TM49 methodology. The CIBSE DSY1 represents a moderately warm summer.
 - Design summer year weather file for London Weather Centre, based on an urban location for 1976 (DSY2), has been used on the simulations as required by TM49 methodology. The CIBSE DSY2 represents summer with a long period of persistent warmth.
 - Design summer year weather file for London Weather Centre, based on an urban location for 2003 (DSY3), has been used on the simulations as required by TM49 methodology. The CIBSE DSY3 represents a summer with a single intense warm spell.

- A5.15 The building fabric parameters have been based on the same level of performance as that detailed in the energy strategy. A summary of the thermal envelope values used in the assessment is shown in Table 4.1.
- A5.16 In line with the TM59 methodology, the following internal gains and time periods have been employed for this analysis.

Table A5.1 Occupancy heat gains

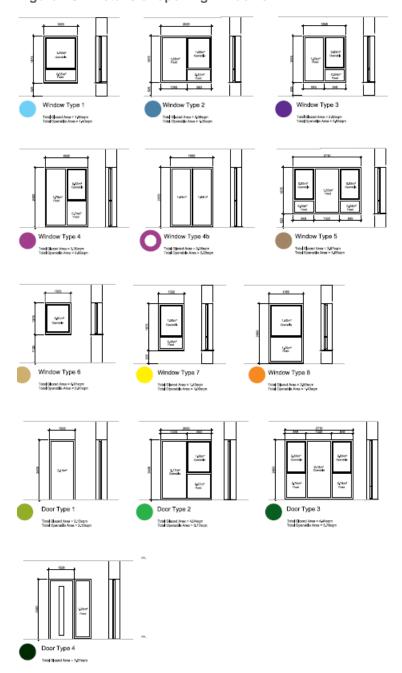
Room	Sensible heat gain (W/person)		Occupancy period
Kitchen/Living Room	75	55	Full gains from 9am-10pm
Bedroom	52.5	38.5	70% gains from 11pm to 8am; 100% gains from 8am to 9am and from 10pm to 11pm; 50% gains from 9am to 10pm.

Table A5.2 Equipment heat gains

Room	Heat gain (W)	Occupancy period
Kitchen/Living Room	450 W 200 W 110 W 85 W	6pm to 8pm 8pm to 10pm 9am to 6pm and 10pm to 12pm All other times
Bedroom	80 W 10 W	9am to 11pm All other times
Cupboard	20 W (from heat interface unit)	24 hours

- A5.17 A lighting gain of 2 W/m² has been applied from 7pm to 11pm to all occupiable rooms.
- A5.18 Passive ventilation was modelled based on information provided by HTA Architects as part of the planning submission documentation. The openable windows for each apartment tested were set out as per the drawings provided below in Figure A6.4.

Figure A5.4 Details of opening windows



A5.19 The TM59 methodology states that internal blinds can be included for the analysis only if specifically included in the design, provided in the base build and explained within associated home user guide. In addition, blinds should not be used if they clash with the opening of windows. The proposed overheating mitigation strategy does not rely on the use of internal blinds, and they have not been included as part of this assessment.

A5.20 An infiltration rate of 0.25 air changes per hour has been used for all dwellings, and has been derived from CIBSE Guide A (2015) for a dwelling with an air permeability of 3m³/hr per m² @ 50Pa for low rise and high-rise dwellings.

- A5.21 Background mechanical ventilation will be provided by MVHR units as required by Part F of the Building Regulations. The ventilation rate included in the model is 1.5 air changes per hour for all rooms.
- A5.22 As stated above mechanical cooling is not proposed for the residential elements of the scheme.

Results

A5.23 The table below shows the results of the simulation incorporating the inputs described above.

Table A5.3 DSY1 Results

Room		Criterion 1		Criterion 2		Result
		Max.	Hours	Max.	Night Hours	Pass/Fail
		Exceedable	Exceeded	Exceedable	Exceeded	
		Hours		Night		
				Hours		
Dwelling	1,	110	0	32	3	Pass
Bedroom 1						
Dwelling	2,	110	4	32	3	Pass
Bedroom 1						
Dwelling	3,	110	9	32	5	Pass
Bedroom 1						
		440		00		_
Dwelling	3,	110	3	32	4	Pass
Bedroom 2						
Duralling 4 Ctu	dia	110	7	32	2	Door
Dwelling 4, Stu	aio	110	7	32	3	Pass
Dwelling	5,	110	4	32	3	Pass
Bedroom 1	J,	110	4	32	3	rass
Bearoom 1						
Dwelling	6,	110	10	32	5	Pass
Bedroom 1	,	. 10	.0	<u></u>	-	. 400
Dwelling	7,	110	12	32	10	Pass
Bedroom 1						
Dwelling	8,	110	12	32	7	Pass
Bedroom 1						

Dwelling 1, Living Room/Kitchen	59	3	N/A	N/A	Pass
Dwelling 2, Living Room/Kitchen	59	11	N/A	N/A	Pass
Dwelling 4, Living Room/Kitchen	59	10	N/A	N/A	Pass
Dwelling 5, Living Room/Kitchen	59	0	N/A	N/A	Pass
Dwelling 6, Living Room/Kitchen	59	1	N/A	N/A	Pass
Dwelling 7, Living Room/Kitchen	59	9	N/A	N/A	Pass
Dwelling 8, Living Room/Kitchen	59	8	N/A	N/A	Pass

Table A5.4 DSY2 Results

Room		Criterion 1		Criterion 2	Result	
		Max. Exceedable Hours	Hours Exceeded	Max. Exceedable Night Hours	Night Hours Exceeded	Pass/Fail
Dwelling Bedroom 1	1,	110	25	32	24	Pass
Dwelling Bedroom 1	2,	110	31	32	29	Pass
Dwelling Bedroom 1	3,	110	31	32	27	Pass

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Dwelling 3,	110	29	32	22	Pass
_	110	29	32	22	Fd55
Bedroom 2					
Dwelling 4, Studio	110	31	32	24	Pass
Dwelling 5,	110	32	32	26	Pass
Bedroom 1					
Durallina C	440	20	20	07	Dana
Dwelling 6,	110	30	32	27	Pass
Bedroom 1					
Dwelling 7,	110	44	32	43	Fail
Bedroom 1					
Dwelling 8,	110	40	32	40	Fail
Bedroom 1					
Bearcom 1					
					_
Dwelling 1, Living	59	33	N/A	N/A	Pass
Room/Kitchen					
Dwelling 2, Living	59	38	N/A	N/A	Pass
Room/Kitchen					
Dwelling 4, Living	59	34	N/A	N/A	Pass
Room/Kitchen	00	04	14/73	14/7	1 433
Kooni/Kitchen					
Dwelling 5, Living	59	29	N/A	N/A	Pass
Room/Kitchen					
Dwelling 6, Living	59	29	N/A	N/A	Pass
Room/Kitchen					
Dwelling 7, Living	59	35	N/A	N/A	Pass
Room/Kitchen	00		1 4/ / (14/71	1 400
Koom/kitchen					
Dwelling 8, Living	59	35	N/A	N/A	Pass
Room/Kitchen					

Table A5.5 DSY3 Results

Room	Criterion 1		Criterion 2	Result	
	Max. Exceedable Hours	Hours Exceeded	Max. Exceedable Night Hours	Night Hours Exceeded	Pass/Fail
Dwelling 1, Bedroom 1	110	22	32	17	Pass
Dwelling 2, Bedroom 1	110	34	32	22	Pass
Dwelling 3, Bedroom 1	110	40	32	21	Pass
Dwelling 3, Bedroom 2	110	34	32	17	Pass
Dwelling 4, Studio	110	37	32	18	Pass
Dwelling 5, Bedroom 1	110	35	32	20	Pass
Dwelling 6, Bedroom 1	110	34	32	20	Pass
Dwelling 7, Bedroom 1	110	46	32	32	Pass
Dwelling 8, Bedroom 1	110	46	32	7	Pass
Dwelling 1, Living Room/Kitchen	59	33	N/A	N/A	Pass

Dwelling 2, Living Room/Kitchen	59	49	N/A	N/A	Pass
Dwelling 4, Living Room/Kitchen	59	44	N/A	N/A	Pass
Dwelling 5, Living Room/Kitchen	59	25	N/A	N/A	Pass
Dwelling 6, Living Room/Kitchen	59	28	N/A	N/A	Pass
Dwelling 7, Living Room/Kitchen	59	37	N/A	N/A	Pass
Dwelling 8, Living Room/Kitchen	59	34	N/A	N/A	Pass

- A5.24 It can be concluded that all the tested dwellings pass the TM59 overheating criteria for the DSY1 and DSY3 scenarios. However, the bedrooms of dwellings 7 and 8 on the ninth floor are predicted to fail under the DSY2 scenario. The level of exceedance predicted for these bedrooms is 1.3% (43 hours). This compares with a target exceedance of 1.0% (32 hours). The additional 0.3% (11 hours) over the course of a year is not considered to be significant.
- A5.25 The building design and building services design have maximised all available measures to minimise heat generation within the dwellings, to reduce the amount of heat entering the building, and to passively and mechanically ventilate the dwellings in line with the cooling hierarchy in Policy 5.9 of the London Plan.

Conclusion

- A5.26 This study has shown how the proposed development at Belmont Street has been designed to minimise the risk of overheating. The strategy has followed the cooling hierarchy in Policy 5.9 of the London Plan.
- A5.27 TM59:2017 has been adopted for this overheating study as it is the recommended methodology for the assessment of overheating risk in dwellings.

- A5.28 The new methodology aims to produce a test that encourages good design that is comfortable within sensible limits, without being so stringent that it over-promotes the use of mechanical cooling.
- A5.29 Eight apartments were chosen for this overheating assessment, identified as the dwellings with the highest risk of overheating due to their location, aspects, orientations and glazing ratios.
- A5.30 A dynamic thermal model was created in ESL TAS to simulate the internal conditions in each of the occupied spaces within the selected sample dwellings.
- A5.31 The modelling incorporated inputs provided within the TM59 methodology guidance and information provided by HTA Architects.
- A5.32 The building design and building services design have maximised all available measures to minimise heat generation within the dwellings, to reduce the amount of heat entering the building, and to passively and mechanically ventilate the dwellings in line with the cooling hierarchy in Policy 5.9 of the London Plan.
- A5.33 The results were then compared to the CIBSE TM59 overheating criteria for the three weather files specified in CIBSE TM49. It can be concluded that all dwellings pass the TM59 overheating criteria for the DSY1 and DSY3 weather files. For the DSY2 scenario, failures are predicted for two of the eight bedrooms tested. However, the extent of the failure is not significant, with a 1.3% exceedance of target temperatures, compared with the guidance target exceedance of 1.0%.
- A5.34 If overheating was found to be an issue in future for these dwellings, the following mitigation measures should be explored:
 - Retrofitted solar control film to minimise solar gain
 - · Additional external shading to limit solar gain
 - Improved blinds to reduce solar gain
 - Increased MVHR flow rates for additional purge ventilation
 - Use of free standing fans
 - Ventilation grilles for ground floor dwellings

A6. GENERAL NOTES

- A6.1 The report is based on information available at the time of the writing and discussions with the client during any project meetings. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by Iceni Projects Ltd for inaccuracies in the data supplied by any other party.
- A6.2 The review of planning policy and other requirements does not constitute a detailed review. Its purpose is as a guide to provide the context for the development and to determine the likely requirements of the Local Authority.
- A6.3 No site visits have been carried out, unless otherwise specified.
- A6.4 This report is prepared and written in the context of an agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in guidance may necessitate a re-interpretation of the report in whole or in part after its original submission.
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